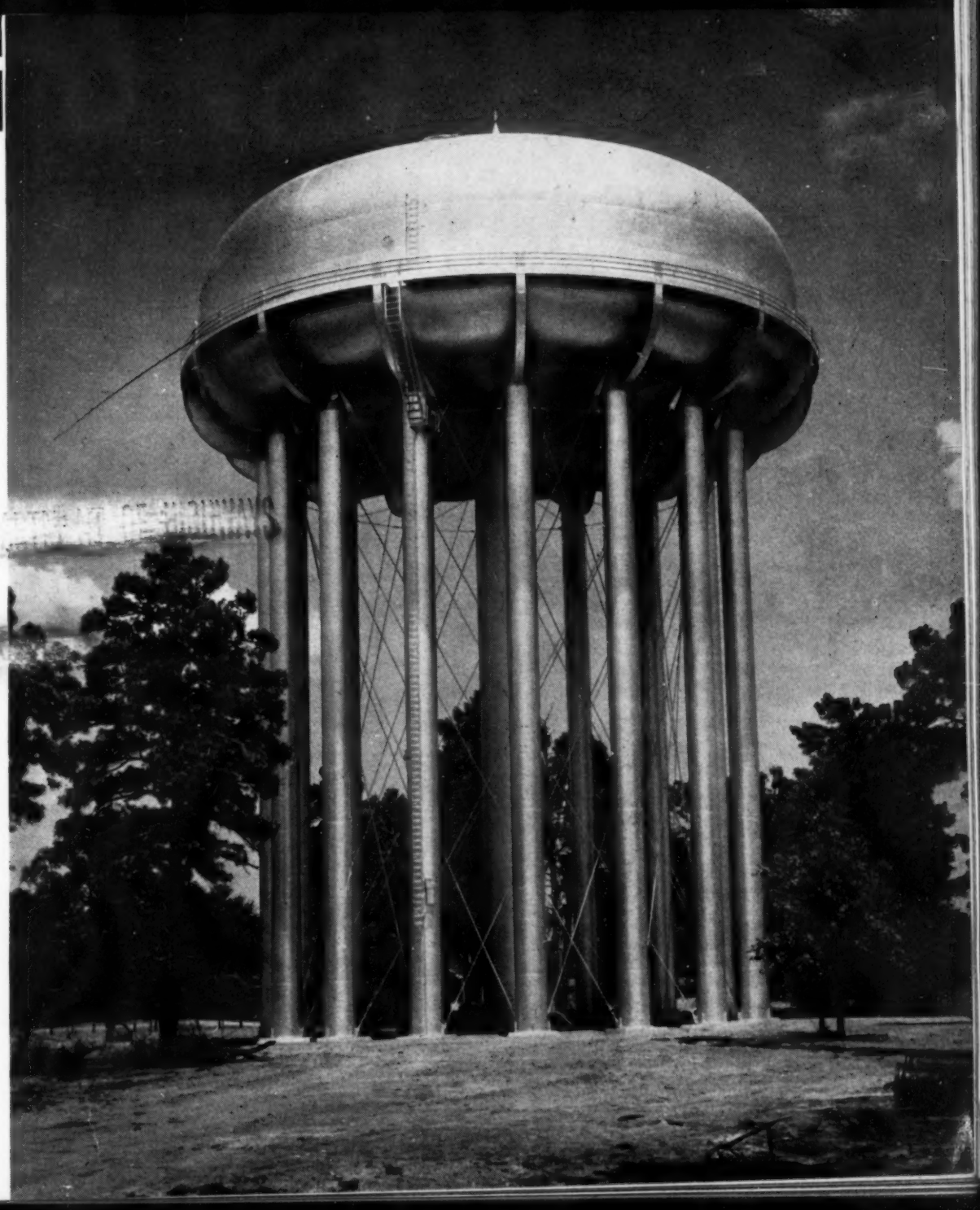
WATER & SEWAGE WORKS



SHREVEPORT BOASTS THIS NEW 2 M.G.

A GILLETTE PUBLICATION

*Section 2 is the 1947 Index

NOW...NO WATER SUPPLY JOB TOO SMALL... OR TOO LARGE!

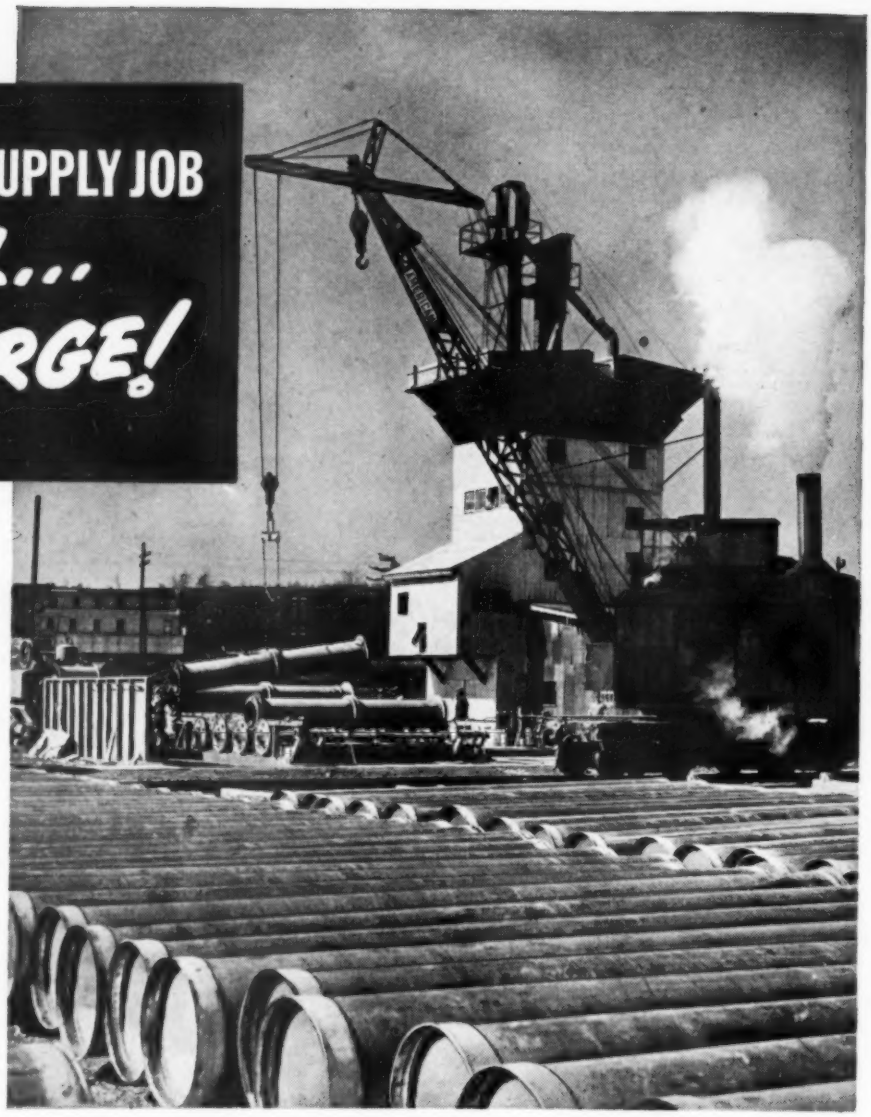
With the establishment of its new permanent pressure pipe plant in Wharton, N. J., Lock Joint Pipe Company is now able to supply pressure pipe in any desired quantity and in a larger range of diameters than heretofore.

The Wharton Plant, specializing in Lock Joint Prestressed Concrete Cylinder Pipe, is equipped to produce pressure pipe in all standard diameters from 16" up, and for all pressures common to American water works practice.

★ ★ ★

Prompt delivery can be effected by truck for short hauls direct to the installation site, or by rail to more distant localities.

SCOPE OF SERVICES — Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.



LOCK JOINT PERMANENT PRESSURE PIPE PLANT AT WHARTON, N. J.

LOCK JOINT PIPE COMPANY

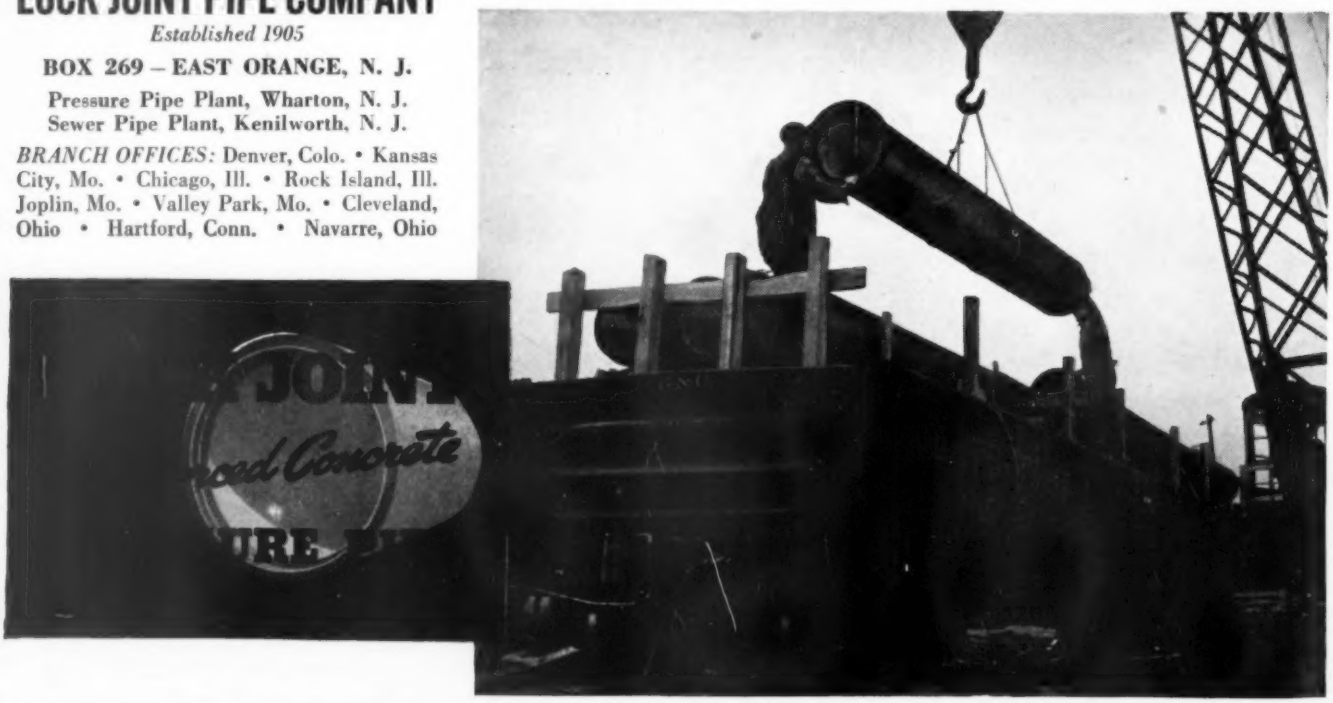
Established 1905

BOX 269 — EAST ORANGE, N. J.

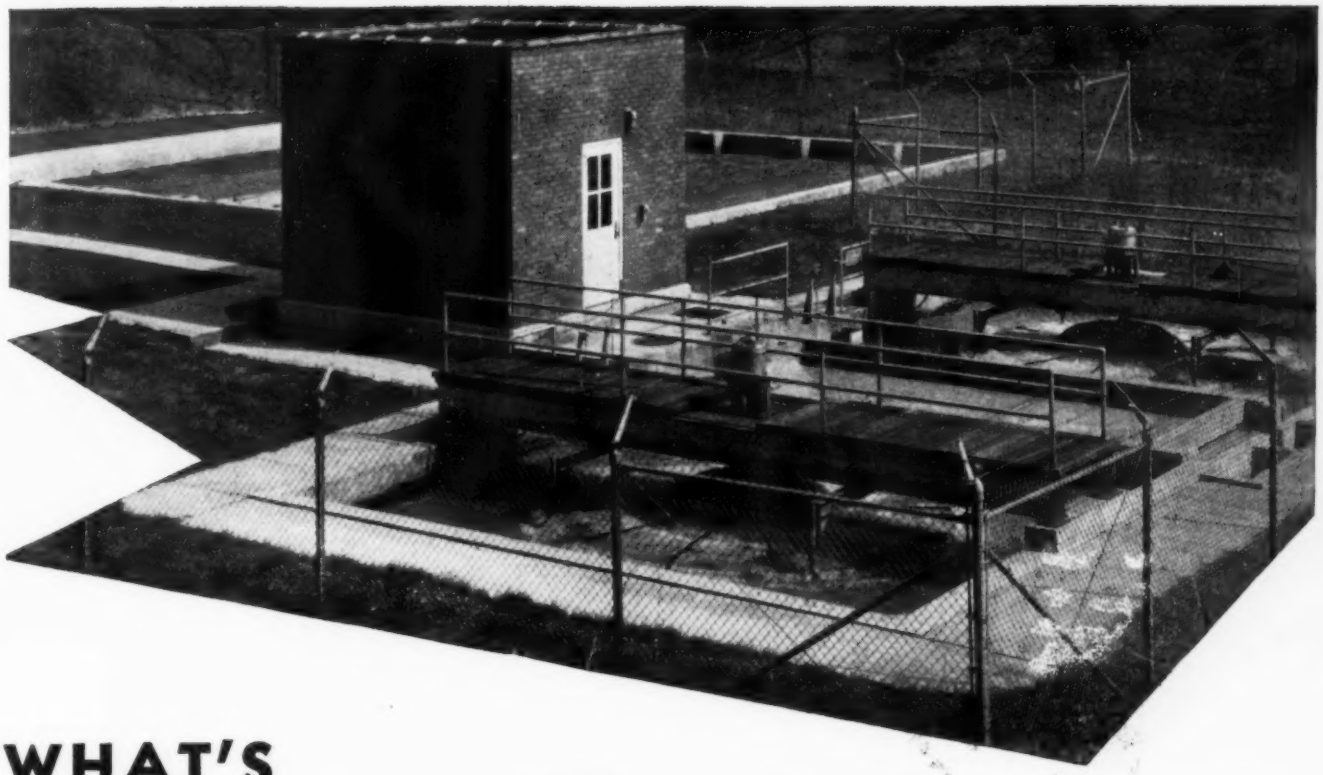
Pressure Pipe Plant, Wharton, N. J.
Sewer Pipe Plant, Kenilworth, N. J.

BRANCH OFFICES: Denver, Colo. • Kansas City, Mo. • Chicago, Ill. • Rock Island, Ill. Joplin, Mo. • Valley Park, Mo. • Cleveland, Ohio • Hartford, Conn. • Navarre, Ohio

LOADING PIPE IN RAILROAD CARS AT WHARTON PLANT



WATER AND SEWAGE WORKS. Reg. U. S. Patent Off, January, 1948. Volume 95. Number 1. Published monthly by Gillette Publishing Co., 22 W. Maple St., Chicago 10, Ill. Per copy, 25c. Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign $3.00 per year. Entered as Second Class Matter, March 12, 1946, at the Post Office at Chicago, Ill., under act of March 3, 1879.



WHAT'S IN THE *Pakage.....* THAT'S WHAT COUNTS

We at the Chicago Pump Company are justifiably proud of the neat, compact appearance and successful operation of the more than one hundred and twenty Chicago equipped "Pakage" Sewage Treatment plants. The Aerator-Clarifier, which is the heart of these plants, has been tried under the most exacting conditions and has proved its worth beyond any question.

We have chosen the name, "Pakage", to distinguish Chicago equipped plants because we are proud of what goes into them . . . equipment that has performed successfully year after year. "Pakage" plants are engineered to meet requirements. They were specifically developed to serve communities, housing projects, factories, airports and other establishments where flows of 500,000 G.P.D. or under occur. They are not dimensionally scaled down from large plant design.

Supervision by non-technical personnel is the rule on "Pakage" plants. The simple tests and adjustments required to produce the sparkling clear effluent common to "Pakage" plants are readily taught by Chicago Operating Sanitary Engineers . . . a service furnished with every plant. Complete literature available . . . ask your consulting engineer.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2349 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**

Flush-Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs, Water Seal Pumping Units, Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

HTH—what's that?

Herman the Hippo wouldn't know, or care. But water works officials know Sanitation HTH—the dependable chlorine carrier that purifies water, cleans filtration screens, controls algae, sterilizes new mains. Easy to apply, HTH is especially helpful in emergency chlorination . . . meets the demand for *complete* protection in any community. Write for Mathieson's 80-page booklet, "Hypo-chlorination of Water"—it's free to water works men. The Mathieson Alkali Works (Inc.), 60 East 42nd Street, New York 17, N. Y.

Sanitation HTH is available in cases of nine 5-lb. cans and in 100-lb. drums.

Mathieson
SANITATION HTH

Sanitation HTH...Liquid Chlorine...Chlorine Dioxide...PH-Plus (Fused Alkali)...Caustic Soda...Soda Ash...Bicarbonate of Soda...Ammonia, Anhydrous & Aqua...Dry Ice...Carbonic Gas . . . Sodium Chlorite Products . . . Sodium Methylate

WATER & SEWAGE WORKS

E. S. GILLETTE, Publisher
22 W. Maple St., Chicago 10, Ill.

L. H. ENSLOW, Editor
155 East 44th Street, New York 17, N. Y.

COMING!

Developments of 1947 in the Sewerage and Industrial Waste Field

Is to be the annual review customarily featured in our February issues. For the year 1947 the reviewer is the President of the Federation of Sewage Works Associations, who has the reputation of being a keen observer and analyst, and a practitioner of sound engineering and practical methods of financing sewerage improvements. He is the stalwart—

GEORGE S. RUSSELL, Pres.,
Russell & Axon Engr's., St. Louis, Mo.

Operation and Maintenance of Pneumatic Storage Tanks

There has developed a decided interest in underground pneumatic water storage tanks for improving service to the fringe areas of the water supply system where some form of pressure storage or booster pumping is the economical remedy. As a guide to the users of pneumatic storage facilities we have arranged to publish an article dealing with the proper and economical installations, operation and maintenance of this form of distribution storage by an engineer well qualified to develop such an article—

J. B. WILKINSON, Chief Engr.,
Fire Ins. Rating Bureau, Milwaukee, Wis.

Sizing Sanitary Sewers

Is an article which presents a novel method of designing (sizing) sanitary sewer systems with the aid of graphic diagrams developed by—

JOHN G. MONTGOMERY, Sanitary Engr.
Veteran's Administration, Washington, D. C.

"Know Your Valves and Hydrants"

Is an excellent review of the most common troubles which water and sewage works operators experience in the operation and maintenance of water and hydrants. More important are the remedies suggested for such troubles; and still more important are the preventative measures recommended. This article is based on experiences of many operators gathered together and passed on to the reader by a field representative of an important valve and hydrant manufacturer—

ALBERT G. SCHEINERT,
Rensselaer Valve Co., Pittsburgh, Pa.

Utilization of Chlorine During Septicization of Sewage

Is a report on studies made of sewage chlorination and the economics of the process as affected by septicization, all of which has a pertinent bearing on methods of chlorination to employ in order to obtain maximum effectiveness and the greatest chlorine economy. The author is—

H. HEUKELEKIAN,
Rutgers Univ., New Brunswick, N. J.

Hydraulics for the Practical Water Works Man

Is a continuing series of articles by Prof. R. W. Angus of Toronto, for many years a teacher of hydraulics and consulting engineer.

The Operation of Small Filtration Plants

Is the subject of a new series of short articles dealing with the operation and maintenance of small filtration plants by an author who has had considerable experience in filter plant and pumping station operation—

A. E. CLARK, Gen'l Mgr.,
Nashville Sup. Utilities Dist., Nashville, Tenn.

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THE CUSTOMERS TELL US

This is a "man bites dog" version of what we have been saying in our advertisements for these many years — namely, that the great majority of the *original* cast iron water mains, laid in this country from the earliest days, are still in service. Now our customers give *us* the facts—facts secured *by* users, *from* users, *for* users.

The chart shown on the opposite page is based on a published report of the American Water Works Association of the results of a survey of the "Survival and Retirement of Water Works Facilities" in 25 representative cities. These are facts taken from the records. *They show that 96% of all cast iron water mains ever laid in the 25 surveyed cities, since 1817, in sizes 6-inch and over, are still in service.*

Cast iron pressure pipe production for the year 1947 has exceeded the footage produced in any other peacetime year in the history of the industry, and with increasing availability of raw materials, still greater production can be expected.

Mr. Q-Check says *"Utica, New York, laid its first 6-inch cast iron pipe 99 years ago and 98% of all cast iron pipe of that size ever laid is still in service.*

All statements and percentages regarding service records of cast iron mains set forth in this advertisement are based on published reports of a survey directed by a Joint Committee representing the American Water Works Association, New England Water Works Association, and the Institute of Water Supply Utilities. The findings, as they apply to cast iron pipe, have been reprinted by permission in our brochure "Survival and Retirement Experience with Cast Iron Water Mains." If you have not received a copy, write to Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, 122 South Michigan Avenue, Chicago 3, Illinois.

CAST Q IRON

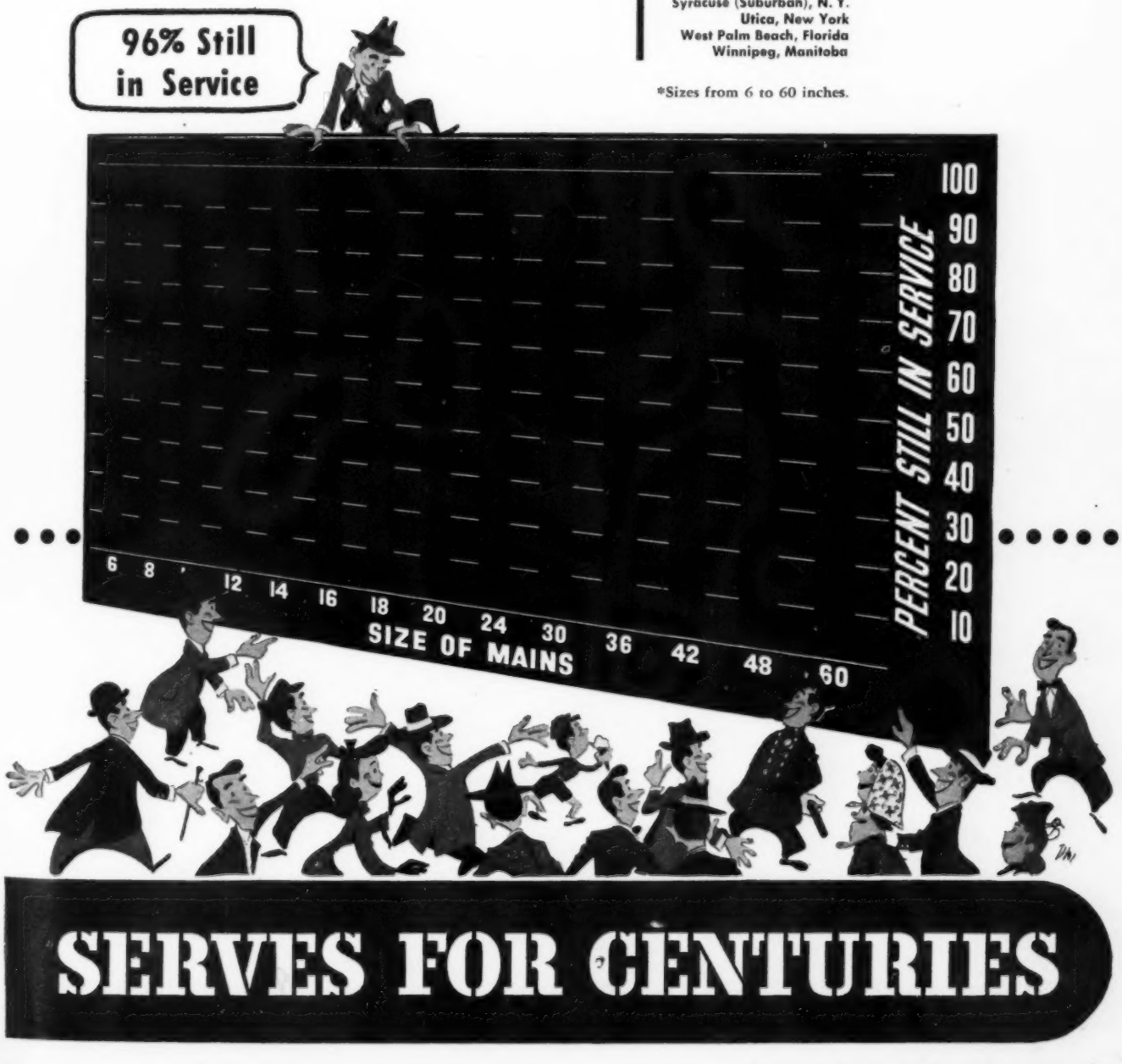
CAST IRON PIPE

HOW GOOD OUR PIPE IS!

96% OF ALL CAST IRON WATER MAINS* LAID IN THESE 25 CITIES OVER A PERIOD OF 128 YEARS IS STILL IN SERVICE.

Alexandria, Virginia
Babylon, New York
Clinton, Iowa
Clyde, New York
Denver, Colorado
Des Moines, Iowa
Detroit, Michigan
Huntington, West Virginia
Jamaica, New York
Merrick, New York
Norwich, New York
Ottawa, Ontario
Philadelphia, Pennsylvania
Portland, Maine
Rochester (Suburban), N. Y.
St. Mary's, Pennsylvania
St. Paul, Minnesota
Sag Harbor, New York
Scranton, Pennsylvania
Springfield, Massachusetts
Summit, New Jersey
Syracuse (Suburban), N. Y.
Utica, New York
West Palm Beach, Florida
Winnipeg, Manitoba

*Sizes from 6 to 60 inches.



SERVES FOR CENTURIES

DAIRYLAND,

Madison, Capitol of Wisconsin, Uses Much Allis-Chalmers Public Works Equipment

BUT MORE THAN THE CAPITOL CITY of America's dairyland, Madison today is a leading commercial, industrial and educational center. It is also the home of the University of Wisconsin, one of the world's great universities. Looking with justifiable pride upon its past achievements, Madison today is laying ambitious plans for an even greater future.

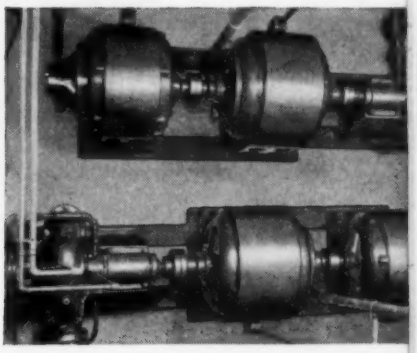
* * * * *

Madison takes particular pride in its municipal water system, judged by experts to be among the most efficient in the nation. Water is supplied from a network of deepwells throughout the city. A metropolitan sewerage commission has provided modern sanitation in the area and is today planning extensive improvements.

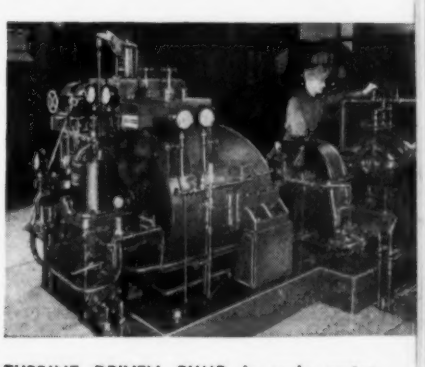
Throughout Madison's entire system of public works you will see Allis-Chalmers turbines, condensers, pumps and motors. All A-C products have delivered constant, dependable performance . . . the kind of *reliable performance* that Allis-Chalmers equipment provides for *all* cities . . . *large, medium* and *small*. When you plan modernization, repairs or improvements, call on the *builders of the world's widest range of public works equipment*. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

A 2374

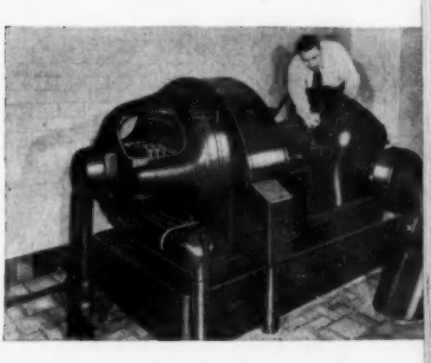
Allis-Chalmers Is Major Supplier for Sewage and Waterworks in Madison



TANDEM DRIVEN SEWAGE PUMPS permit 450 hp induction motors to take over from 200 hp units when head increases. Operating range of each pump varies from 3500 gpm at 65 ft head to 10,400 gpm at 127 ft head. Both units built by A-C.



TURBINE DRIVEN PUMP in main water pumping station. Turbine is rated at 200 hp, 5000 rpm. Pump is a size 10 by 8 in. rated at 3000 gpm capacity with 210 ft head. Installation includes A-C condenser.

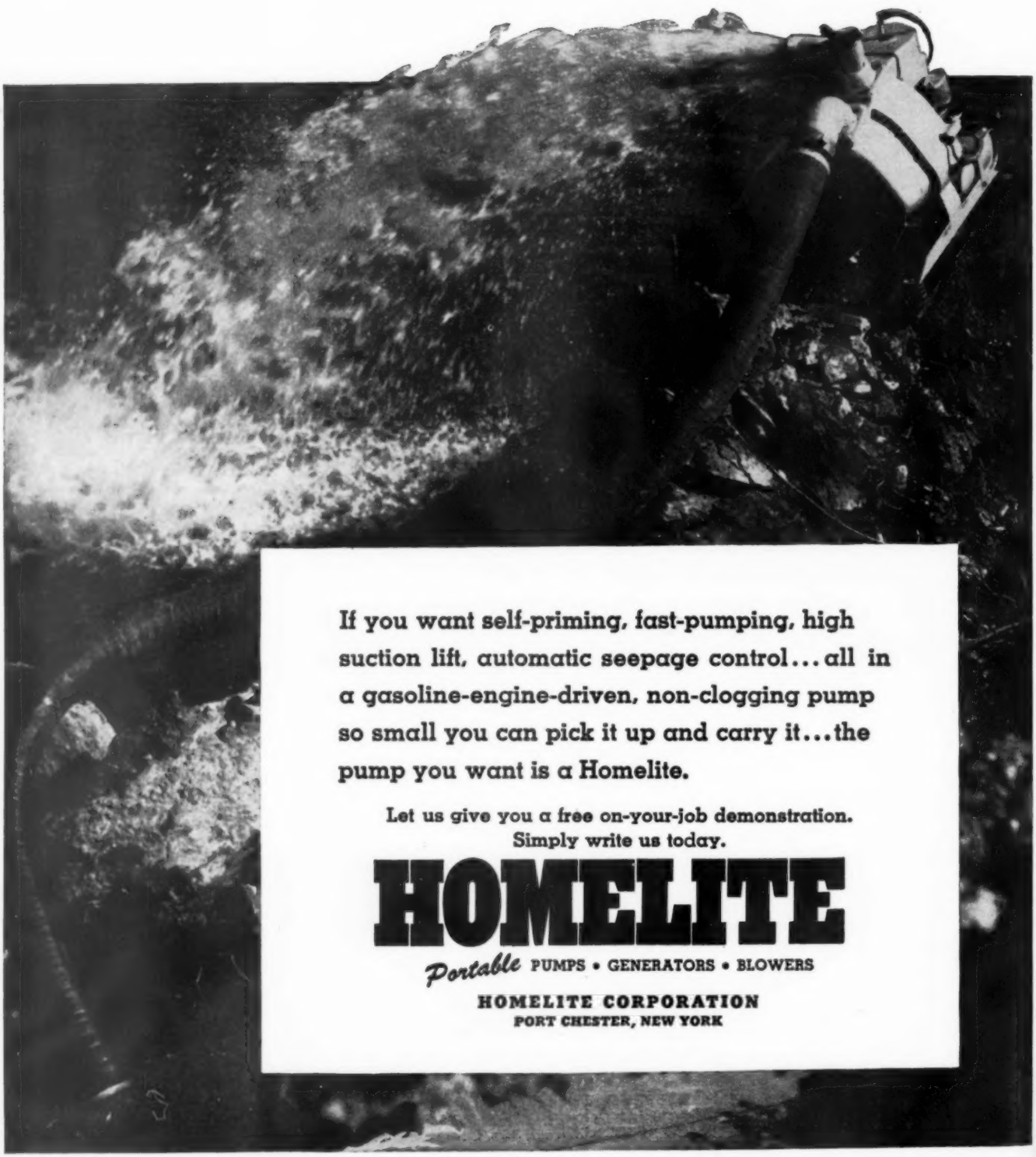


PUMP-MOTOR "TEAM" in water system pumping station has been in successful operation for over 15 years.

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment—Biggest of All in Range of Industrial Products

The Pump
TO PUT ON THE JOB



If you want self-priming, fast-pumping, high suction lift, automatic seepage control... all in a gasoline-engine-driven, non-clogging pump so small you can pick it up and carry it...the pump you want is a Homelite.

Let us give you a free on-your-job demonstration.
Simply write us today.

HOMELITE

Portable PUMPS • GENERATORS • BLOWERS

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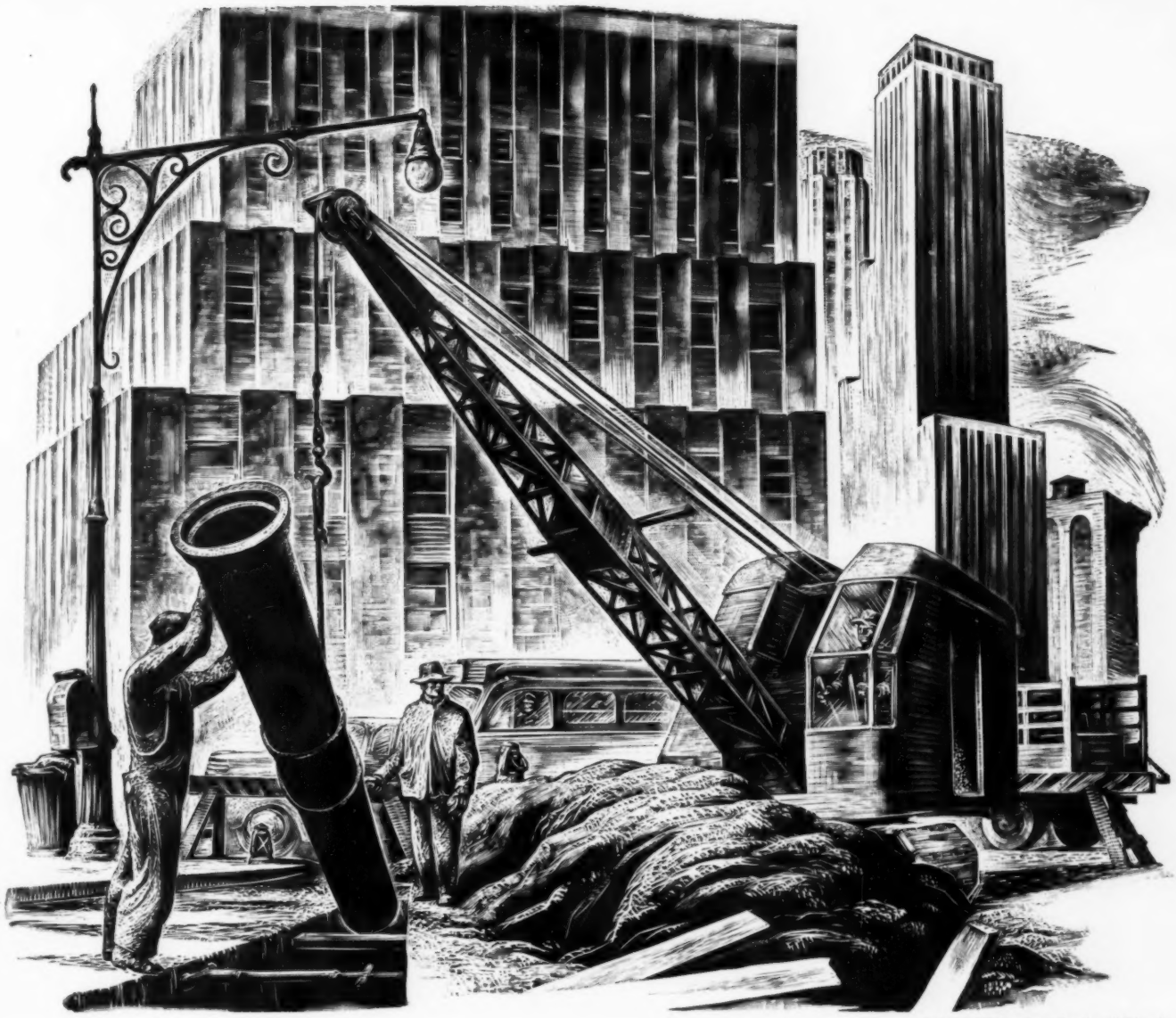
PORT CHESTER, NEW YORK



Original Woodcut by Lynd Ward

Nothing is more certain than change

In this relatively young nation, nothing is more certain than change. Shifting population, suburban developments, apartments replacing private homes, new shopping centers—changes requiring additional or enlarged underground mains for water, gas and sewage. The last quarter-century has witnessed radical changes in methods of producing cast iron pipe, as, for example, the Super-deLavaud process of centrifugal casting, developed by this Company. U. S. Super-deLavaud cast iron pipe is tough; high in tensile strength, impact strength and uniformity of metal structure. Also, a process and product research and development program is being continuously carried out to discover any changes that would result in still better products.

U.S. PIPE

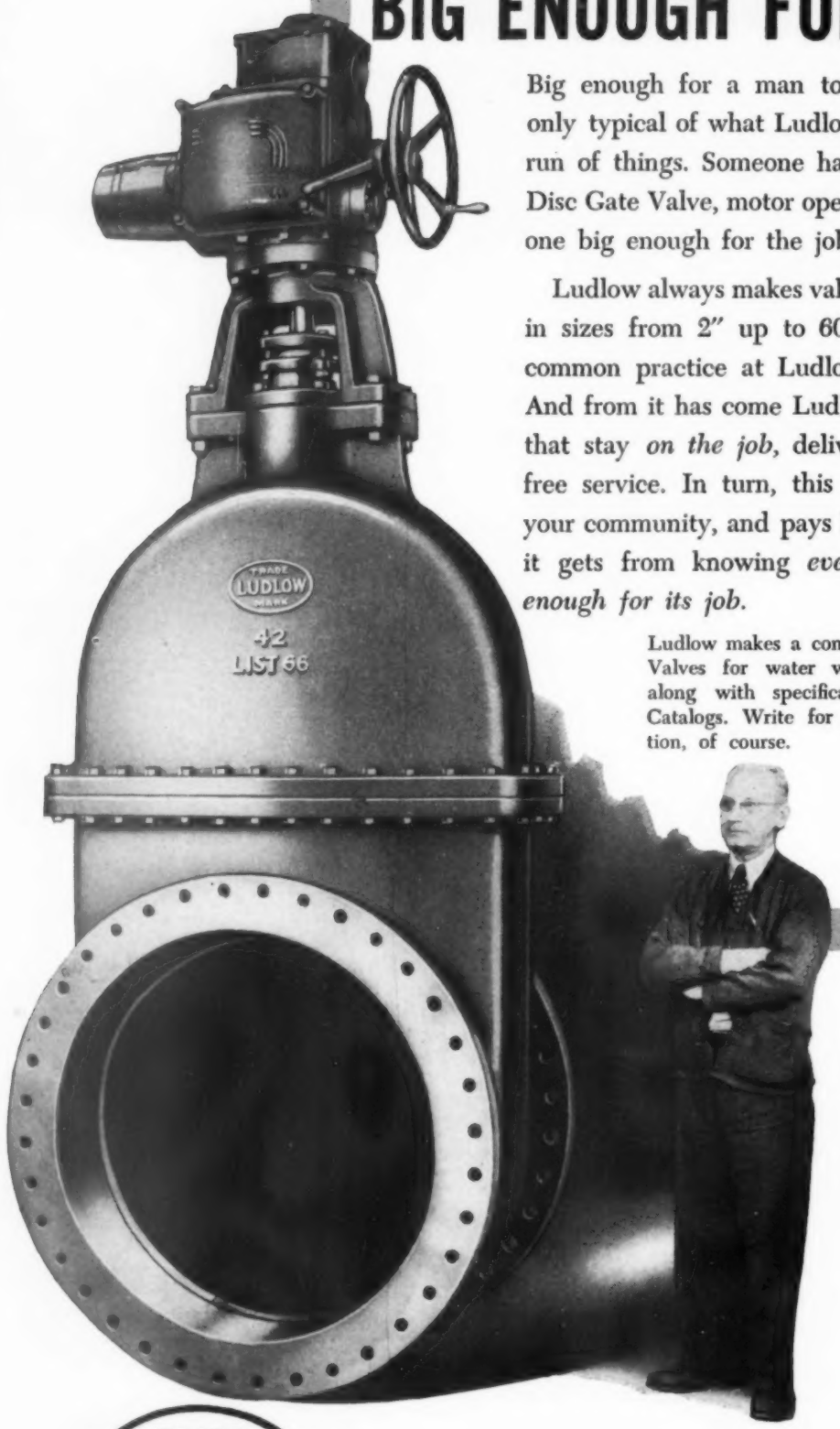
UNITED STATES PIPE AND FOUNDRY CO., GENERAL OFFICES: BURLINGTON, N.J.
Plants and Sales Offices throughout U. S. A.

BIG ENOUGH FOR THE JOB

Big enough for a man to crawl into . . . but, it's only typical of what Ludlow turns out in the general run of things. Someone had a job for a 42" Double Disc Gate Valve, motor operated – and Ludlow made one big enough for the job.

Ludlow always makes valves big enough for the job, in sizes from 2" up to 60" and more. That's been common practice at Ludlow for the past 78 years. And from it has come Ludlow's reputation for valves that stay *on the job,* delivering long-lived, trouble-free service. In turn, this pays you in security for your community, and pays Ludlow in the satisfaction it gets from knowing *every Ludlow valve is big enough for its job.*

Ludlow makes a complete line of Double Disc Gate Valves for water works. You'll find them listed, along with specifications and prices, in Ludlow Catalogs. Write for your copies today. No obligation, of course.



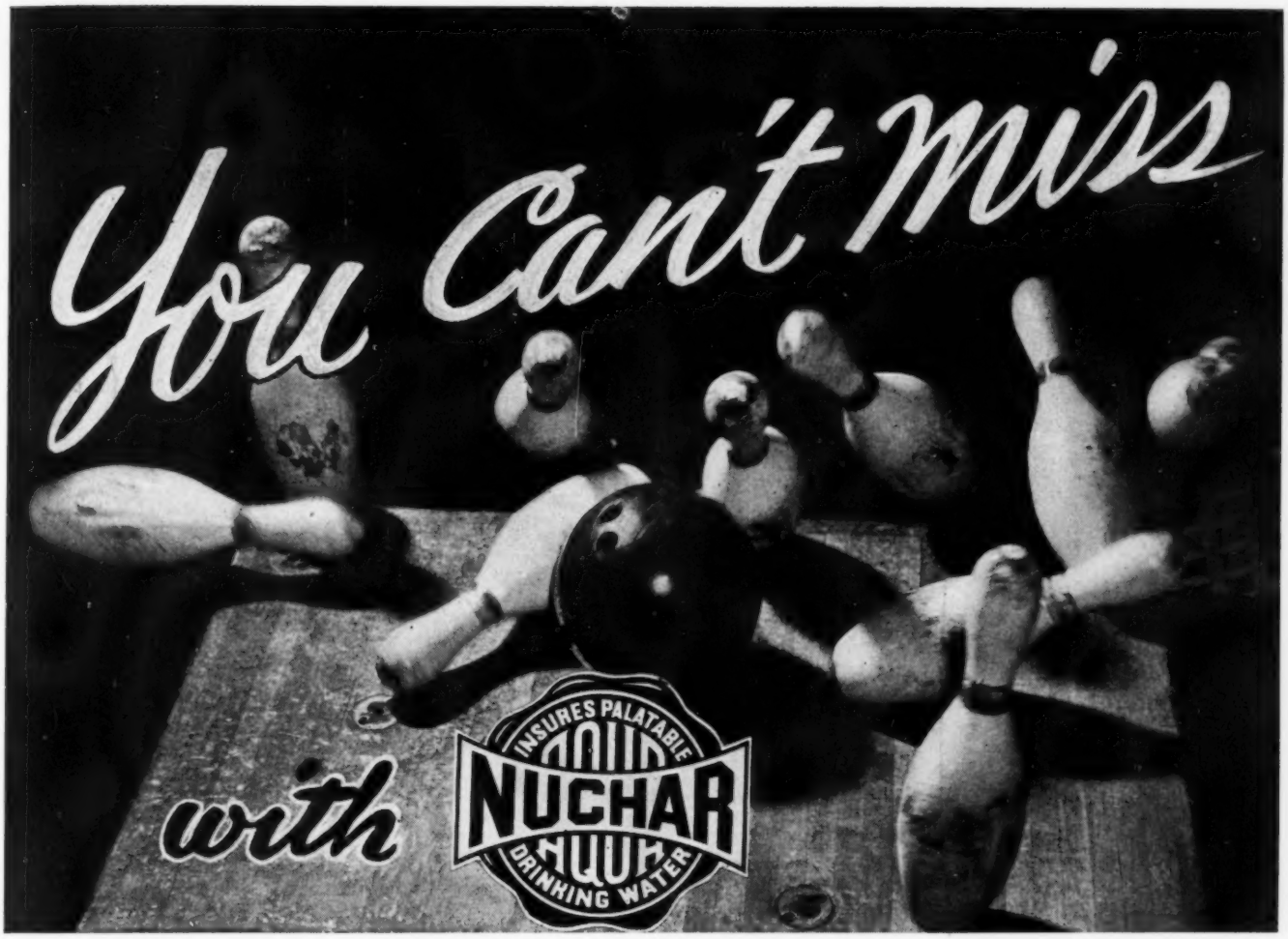
Ludlow Fig. 6619 (left) Flanged, Double Disc Gate Valve with OS&Y. Iron body, bronze mounted. Cold working pressure, 150 lbs. Test pressure 300 lbs. Valve shown is 42 inches, equipped with either electric motor . . . or hydraulic cylinder drive.

V-1

TRADE LUDLOW MARK

The LUDLOW VALVE SINCE 1866

MFG·CO·INC·TROY·N·Y·



An increasing number of Water Plant Operators are employing Aqua Nuchar Activated Carbon because it is the quickest, most economical way to eliminate objectionable tastes and odors and prevent their recurrence. In fact, it is estimated that the year 'round use of Aqua Nuchar Activated Carbon costs an average of less than two cents per capita per year.

Even where there has been no consumer complaint, many plants apply small dosages of Aqua Nuchar Activated Carbon to prevent a sudden taste or odor condition from getting out of hand. Thus, when tastes and odors develop in a raw water supply, it is only necessary to apply somewhat increased dosages of Aqua Nuchar Activated Carbon to control the condition.

In order to better serve the many users of Aqua Nuchar, we maintain warehouse stocks at convenient points throughout the country. Write to our nearest sales office for the location of the Aqua Nuchar storage warehouse nearest you. In most cases, rush deliveries can be made in twenty-four hours or less.

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CHEMICAL SALES
division west virginia pulp and paper company

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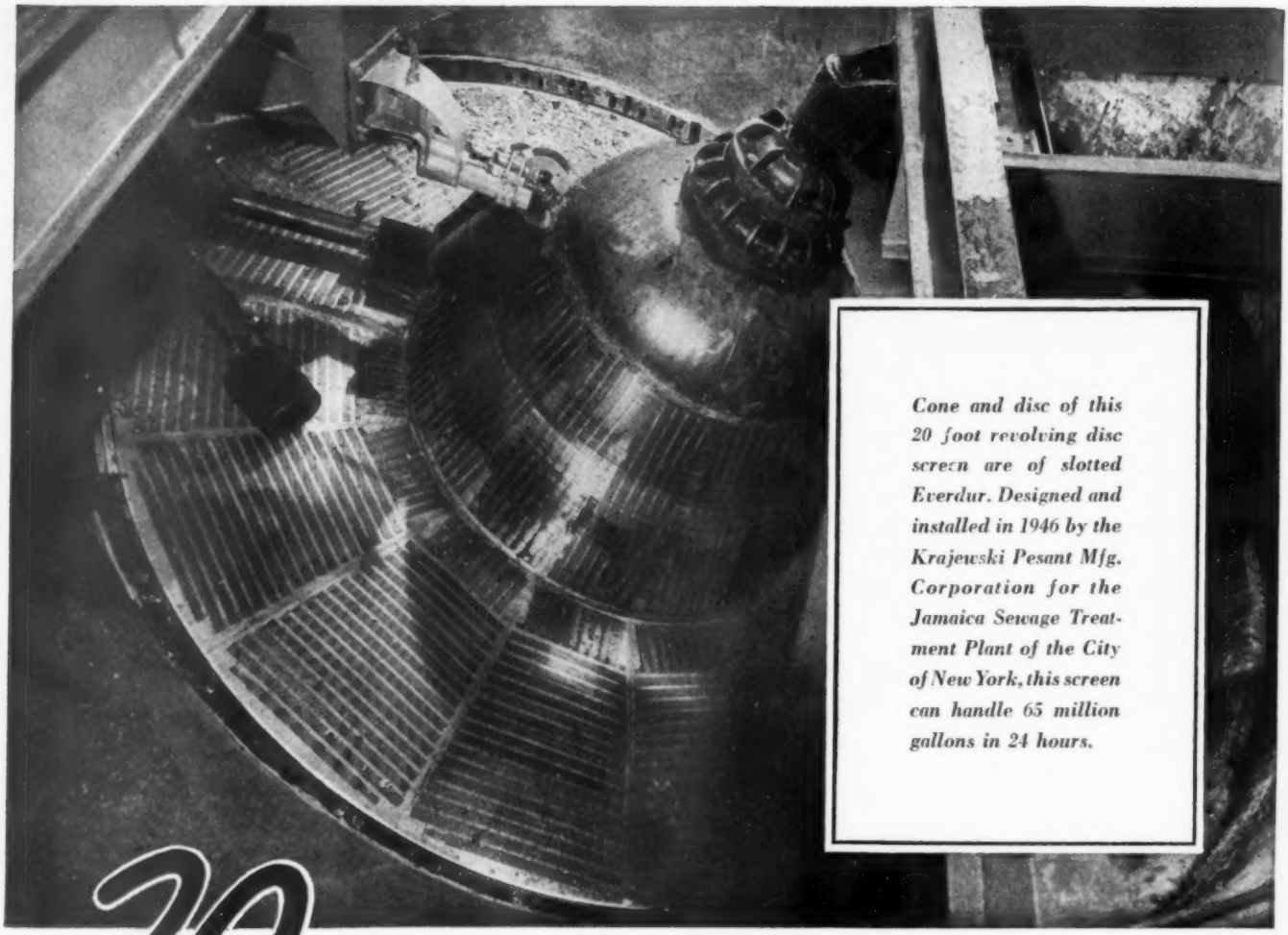
748 PUBLIC LEDGER BLDG.
PHILADELPHIA 6, PA.

844 LEADER BLDG.
CLEVELAND 14, OHIO



Cone and disc of this 20 foot revolving disc screen are of slotted Everdur. Designed and installed in 1946 by the Krajewski Pesant Mfg. Corporation for the Jamaica Sewage Treatment Plant of the City of New York, this screen can handle 65 million gallons in 24 hours.

20 YEARS OF SEWAGE TREATMENT

SERVICE PROVE *Everdur* SUPERIORITY

EVERDUR* copper-silicon alloys have achieved a consistent record for outstanding service and long life in hundreds of sewage and water works installations . . . over a period of twenty years.

Everdur alloys are notable for excellent corrosion resistance and great strength. Depending on the type or composition, they may be worked hot or cold, have good machining properties and are readily formed, forged and welded in producing lightweight built-up equipment of exceptional durability. Everdur equipment installed in 1927 is still in service and in excellent condition after constant use under highly corrosive conditions.

For detailed information write for Publications E-11 and E-5. 47168

*Reg. U. S. Pat. Off.

ANACONDA
from mine to consumer

Everdur

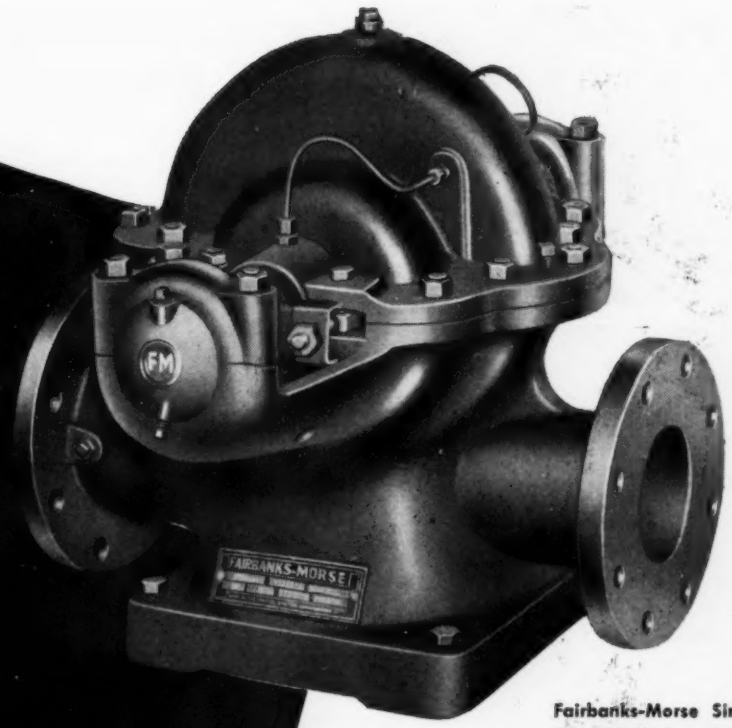
COPPER-SILICON ALLOYS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD.
New Toronto, Ont.



Fairbanks-Morse Single-Stage, Split Case Centrifugal Pump—for dependable, high-speed service.

ONE

When your job demands a multi-stage pump, the Fairbanks-Morse pump expert will recommend the right one from among the broad line built by *his* company . . .

But—frequently he can help you save the cost of a more expensive unit by recommending one of these single-stage, split-case pumps . . . whose performance, where heads reach toward 300 feet and capacities range to 72,000 g.p.h., is often equal to that of more costly multi-stage pumps.

Without prejudice, he can find for you the pump that suits your needs best; for in the Fairbanks-Morse line, he has all types, all sizes.

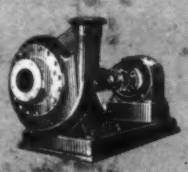
When it comes to pumps...

FAIRBANKS-MORSE

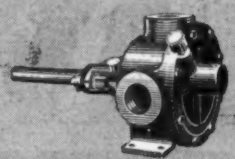
A name worth remembering

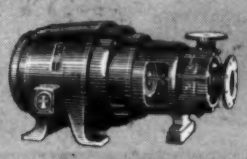
DIESEL LOCOMOTIVES • DIESEL ENGINES • STOKERS • SCALES
MOTORS • GENERATORS • PUMPS • RAILROAD MOTOR CARS and STANDPIPES • FARM EQUIPMENT • MAGNETOS

A FEW OF THE COMPLETE LINE OF FAIRBANKS-MORSE PUMPS


Trash Pumps

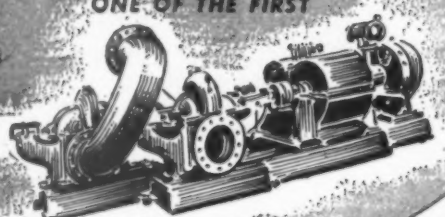
Side-Suction


Rotary

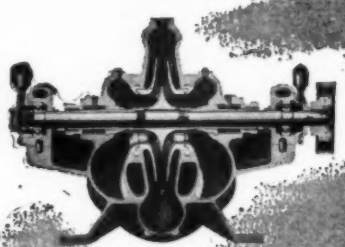

Builtogether

45 Years of PUMP IMPROVEMENT

ONE OF THE FIRST



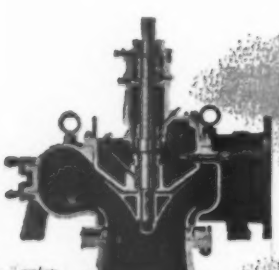
Built by De Laval in 1902



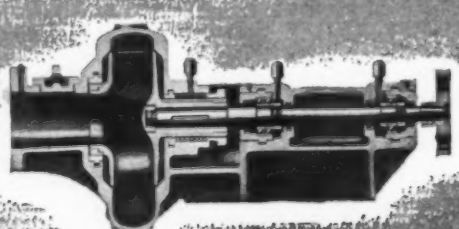
SINGLE STAGE, DOUBLE SUCTION PUMP

Modern De Laval centrifugal pumps represent the culmination of more than 45 years of continual improvement and perfection. This long period of concentration upon the problems of centrifugal pump design and application places at the user's command a complete line of modern, high quality pumps and a vast store of knowledge concerning pump application problems.

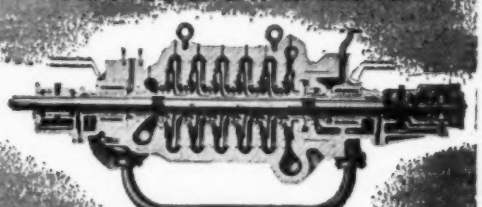
FOUR STAGE, OPPOSED IMPELLER PUMP



MIXED FLOW PUMP



CLOGLESS PUMP



HIGH PRESSURE MULTI-STAGE PUMP

GP-1

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STEAM TURBINE COMPANY
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tank cars, to meet

your requirements

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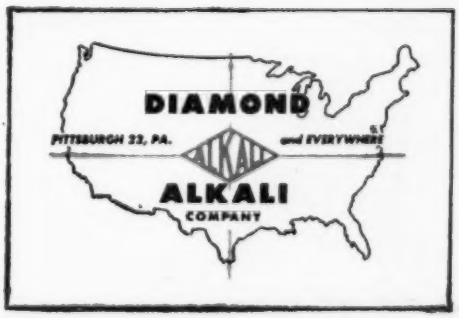
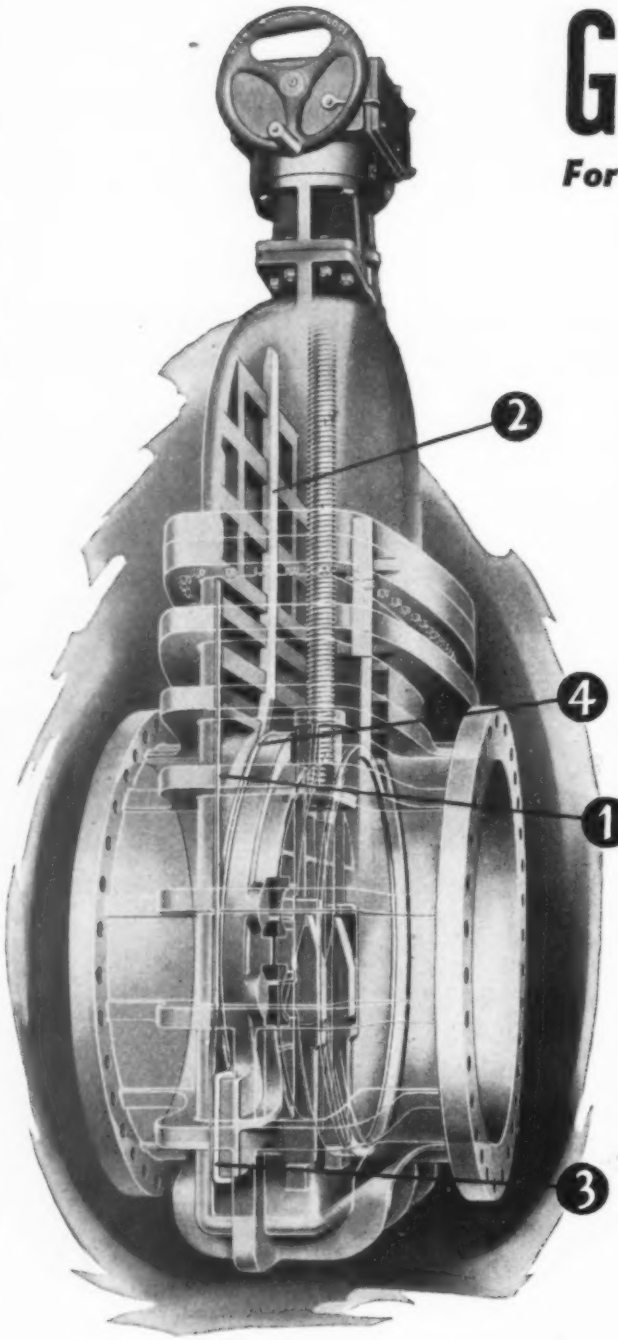
REGISTERED U. S. PAT. OFF.



RENSSELAER "Square Bottom" GATE VALVES

For the most severe service conditions



48" Square Bottom Valve with Motor Operator

This construction provides *three-point support* throughout the length of gate travel. It is ideal for valves subject to frequent operation, throttling service or wherever appreciable differentials in head exist.

They are extensively used as *Wash Water* valves.

Conceived by RENSSELAER in 1916, this design has received widespread acclaim because of its years of outstanding service.

To avoid substitutes, check these points:

1. **STAINLESS STEEL BODY SIDE TRACKS.**
2. **BRONZE CENTER TRACK.**
3. **BRONZE GATE SHOES.**
4. **STAINLESS STEEL CENTER GATE LUG.**

RENSSELAER OFFERS ACCURACY OF DESIGN AND FABRICATION, BACKED BY YEARS OF EXPERIENCE IN BUILDING THESE VALVES.

There has never been developed an effective substitute for good material and workmanship backed by sound design.

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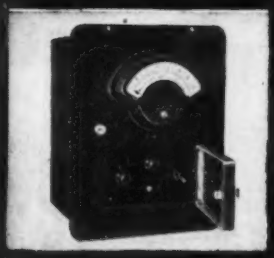
Beckman pH Control is the modern miracle tool with which industries of all types are boosting production efficiencies, reducing waste, obtaining better products at lower operating costs. No matter what your product or operation . . . whether metal finishing, power plant operation, agriculture, food processing, sewage and waste disposal, water supply, chemical processing, oil refining, textile manufacture—to mention only a few . . . if you use water or water solutions *anywhere*—in vats, tanks or flow lines—investigate the savings that can be made, *perhaps are already being made by your competitors*, with the aid of modern Beckman pH Control.

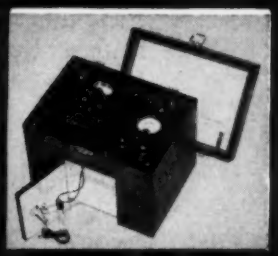
...and the leading name in pH is BECKMAN!

Practically every major advancement in modern glass electrode pH control has been pioneered by Beckman — the simplification of glass electrode equipment from a complicated laboratory set-up to today's practical, compact equipment . . . the introduction of completely automatic pH indication, recording and control . . . the development of High pH and High Temperature Glass Electrodes . . . these and many other Beckman-pioneered advancements make Beckman pH Equipment the most advanced obtainable.

THE BECKMAN MODEL R



THE BECKMAN MODEL G



THE BECKMAN MODEL H

THE BECKMAN MODEL M

BRING YOUR pH PROBLEM TO US

Send for this helpful free booklet! "What Every Executive Should Know About pH" — a non-technical discussion of pH, what it is, how it's used. A copy will gladly be sent you on request.

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National Technical Laboratories, South Pasadena 20, Calif.

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"One of America's Safest Cities"

The Mathews Firemen say

AND THEY'RE PERFECTLY RIGHT. For Cleveland is Mathews-Hydrant-protected. These great hydrants can be depended on to do their important job—to keep on working in their trouble-free way. That has been proved in over 75 years' record-making the world around.

Of course a Mathews can be *damaged*—it can be hit by a truck. But there again the Mathews scores. Because the barrel, containing all the working parts, is *removable*. You simply unscrew the barrel from the elbow, lift it out of the protection case, and screw in a spare. All in a few minutes' time. Interruption to service is brief; replacement and labor cost is low; and the damaged barrel is repaired in the shop, held as a spare. Yes, Mathews design licks even the problem of damage by traffic.

Is it any wonder that Cleveland, sixth city now in the U. S., and pre-eminent in so many ways, should choose Mathews Hydrants?

OTHER MATHEWS FEATURES: Head can be rotated 360° • Replaceable head—nozzle outlets easily changed • Nozzle levels raised or lowered—no excavating • True compression-type main valve • Only one part to oil—operating thread • A modern barrel makes even the oldest Mathews new

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Made by R. D. WOOD COMPANY

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Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

JAMES B. CLOW & SONS . . . . . COSHOCTON, OHIO

BIRMINGHAM, ALABAMA . . . . NATIONAL CAST IRON PIPE

I always like to hear my boy say

"THANK YOU VERY MUCH"

and that is what I say to you today

KENT S. CLOW*

During the war years we were very grateful to you men in the water works field for your understanding of the fact that we could ship our products only under regulations established by our government. Well, you say, the war has been over for two years and cast iron pipe is still in short supply—and badly needed for extensions, improvements, and new installations of water supply systems throughout the country. What's wrong now?

But cast iron pipe is not in short supply. It is true that our product is sold for several months ahead—but it is also true that our shops have been working two shifts a day throughout the past year and are producing more pipe than ever before in the peace-time history of our company. Yes, production is great—but the demand is much greater.

And so, good friends, we must again ask you to bear with us. You have been most helpful in anticipating your requirements and placing your orders well in advance of actual need for delivery. For this, we do want to say—"Thank you very much."

Since 1942, our company has acquired the Eddy Valve Company of Waterford, New York, and the Iowa Valve Company of Oskaloosa, Iowa. Now we are better equipped than ever to provide the water works of America with everything they require for their distribution systems. We hope before many months to be able to give you the service to which you are entitled.

For your understanding of our problem, for your kindly patience, and for your whole-hearted cooperation—we most cordially say

"THANK YOU VERY MUCH"

*President of James B. Clow & Sons, General offices at 201-299 N. Talman Ave., Chicago, Ill.

CAST IRON

PEOPLE TAKE SEWAGE DISPOSAL FOR GRANTED,

But.....

THE HEALTH AND SAFETY OF A COMMUNITY IS DEPENDENT ON EFFICIENT OPERATION OF ITS SEWAGE PLANT.

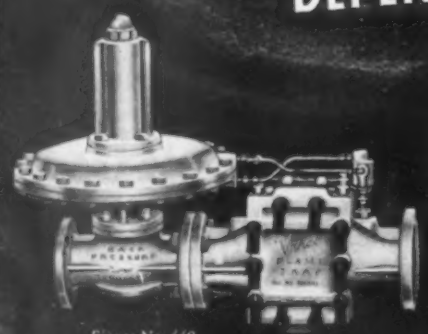

Figure No. 440

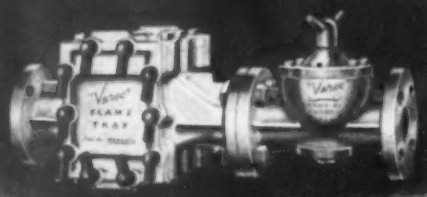

Figure No. 450

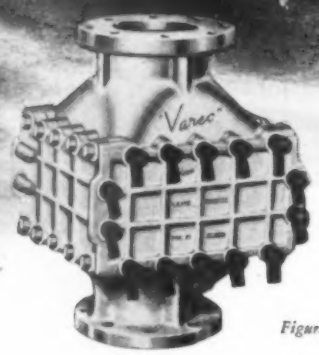

Figure No. 50A.

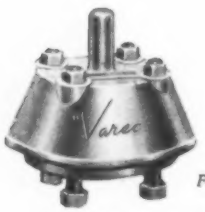

Figure No. 70

If you had to divert sewage gathering because of fire or explosion in the plant, you can readily imagine the catastrophic results. The best insurance is proper fire prevention. With inflammable sewage gases, this means adequate and dependable safety devices that are designed to prevent flame propagation and explosion. Each of the "VAREC" Approved Safety Devices shown below has a definite place in your plant. Whether you are designing a new sewage treatment plant or surveying an old one for fire hazards, insist that dependable "VAREC" Safety Devices be used.

FIGURE 440 "VAREC" *Approved* PRESSURE RELIEF AND FLAME TRAP ASSEMBLY

Consists of Super-Sensitive diaphram-operated Back Pressure Regulator, Flame Trap and Thermal-Controlled Regulator Shutoff Valve. Usually installed in waste-gas line, just upstream of Waste-Gas Burner.

FIGURE 50A "VAREC" *Approved* FLAME TRAP ASSEMBLY

Consists of a Flame Trap and Thermal-Operated Shutoff Valve. Usually installed in all gas lines supplying gas utilization equipment and in line to gas holder and between multiple digestors.

FIGURE 50A "VAREC" *Approved* FLAME ARRESTOR

Allows full flow of gas, yet prevents flame propagation by means of multiple-aluminum-plate grid. Usually installed between digester dome and Pressure-Vacuum Breaker Valve.

FIGURE 70 "VAREC" *Approved* EXPLOSION RELIEF VALVE

Dissipates accumulating pressure waves which travel ahead of actual combustion. Usually installed at top of vertical riser upstream of any source of combustion. Can also be used as an auxiliary pressure relief on digester and gas holder domes.

OTHER "VAREC" *Approved* SEWAGE GAS CONTROL EQUIPMENT

Pressure Relief and Vacuum Breaker Valves—Pressure Reducing Regulators—Back Pressure Regulators—Back Pressure Regulators—Flame Checks—Waste Gas Burners—Manometers—Sediment Traps—Drip Trap Assemblies.

All "VAREC" Sewage Equipment is fully described in the "VAREC" S-3 Catalog. Write for your copy today.

THE VAPOR RECOVERY SYSTEMS COMPANY

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"I personally have tested 20 makes of meters in the last 27 years . . . *you can't go wrong buying Badgers*"

That's what one Waterworks superintendent wrote to another, adding: "I am surprised at the good quality of the Badger Meter and the abuse it will take. When we buy more meters they will be Badgers."

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Send for yours today (no charge)

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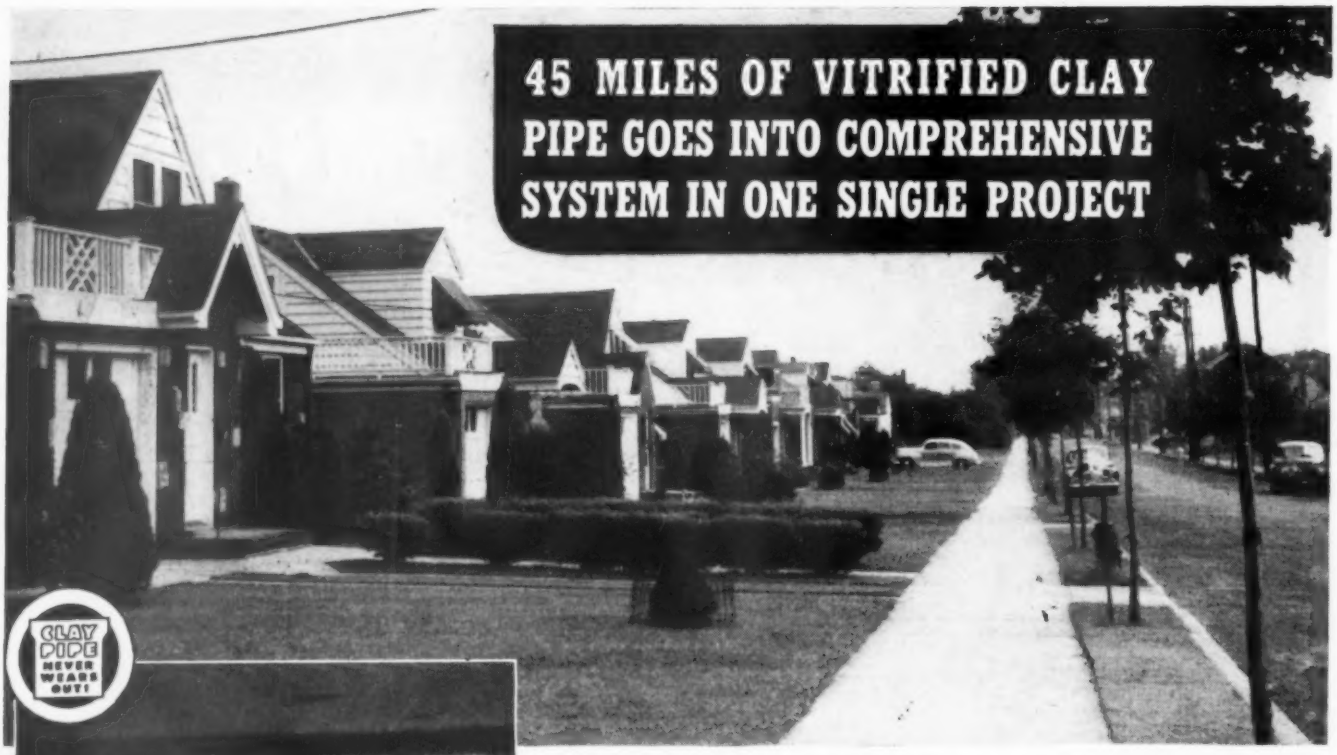

45 MILES OF VITRIFIED CLAY PIPE GOES INTO COMPREHENSIVE SYSTEM IN ONE SINGLE PROJECT

CLAY PIPE NEVER WEARS OUT!

Engineers on the Fair Lawn, New Jersey sewerage installation were Bowe, Albertson and Associates of New York City.

45 Miles of Vitrified Clay Pipe and Clay Pipe fittings, ranging in diameter from 4 inches to 24 inches, were included in the specifications for the sewerage system of the Borough of Fair Lawn, New Jersey. The entire community was sewered as a single project done in two contract stages.

Borough officials and the consulting engineer on this two-million dollar project specified Vitrified Clay Pipe because they wanted a long-lasting, permanent installation. For they, like hundreds of other officials and engineers, know that Vitrified Clay Pipe is the only pipe impervious to the action of corrosive materials, acids and alkalies. In fact, there is no instance on record where Clay Pipe has ever worn out in any municipal sewerage or drainage installations.

If you need specific information on Clay Pipe, write the details to the office nearest you.

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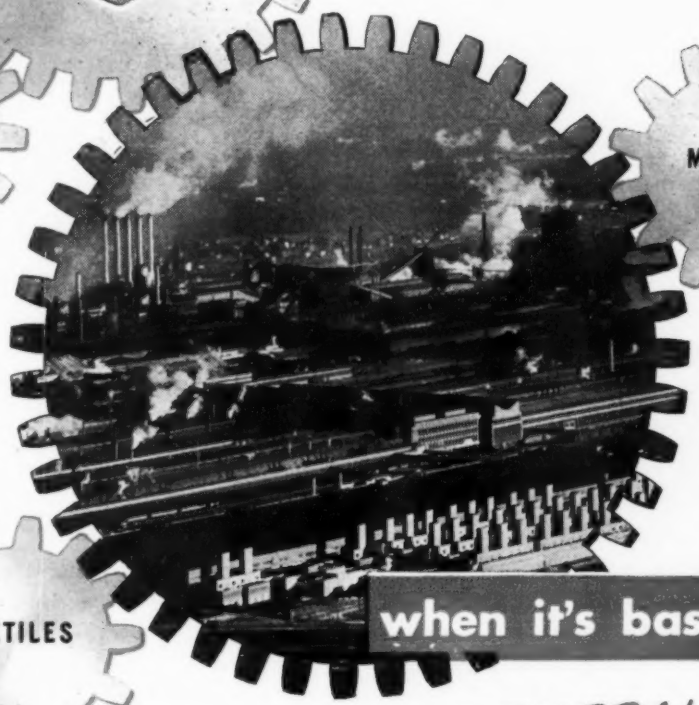

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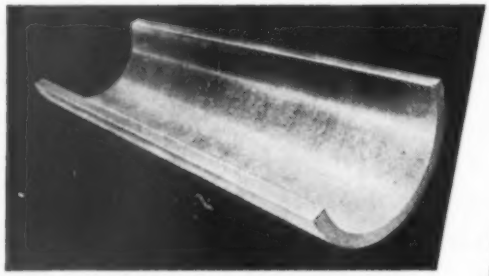
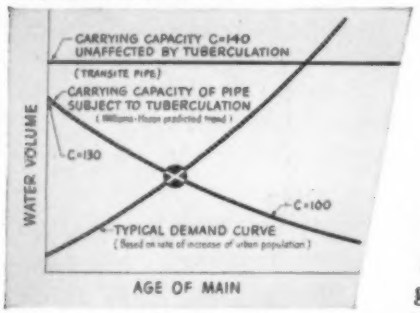
"Plenty of 'fire-flow' here!"

...says the Testing Crew



Transite's smooth interior is permanently unaffected by the destructive effects of tuberculation. Its high carrying capacity *stays high.*



This chart shows that, although water demand continually increases, the carrying capacity of water mains subject to tuberculation progressively decreases. Note the much longer period during which a Transite line, represented by the straight curve, continues to meet demands.

TESTS such as those made periodically by the fire insurance underwriters emphasize the fact that the most effective fire protection is provided by the water pipe with a *maintained* high carrying capacity.

Transite Pressure Pipe has this important advantage. It has an unusually high flow coefficient (C=140) . . . a coefficient which stays high because Transite, being made of asbestos and cement, is completely immune to tuberculation. This troublesome form of internal corrosion can never reduce Transite's initial high carrying capacity.

This means that a Transite water line helps assure the required flow of water for fire-fighting needs. It means that pumping costs can be held to a minimum. And it means that taxpayers can receive the benefits of the favorable fire insurance rates which result from a modern, efficient water distribution system.

The assurance of a maintained high carrying capacity is one of many reasons why it will pay you to investigate Transite Pressure Pipe when you plan water works improvements. Transite's proved resistance to corrosive soils . . . its tight, flexible joints that safeguard against underground leakage . . . its maintained strength and continued low maintenance are other advantages you will want to know more about in connection with your water works projects.

To get all the facts write for brochure TR-11A. Address Johns-Manville, Box 290, New York 16, N. Y.

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Johns-Manville Transite Pressure Pipe

An Asbestos Product

Super-Market for PIPING

● **A GRINNELL WAREHOUSE** can be your *one supplier* of piping . . . a dependable source for *all* your requirements.

In addition to the broad line of Grinnell-manufactured piping products, each Grinnell Warehouse carries a complete stock of pipe, valves, and piping specialties . . . and can help you engineer your piping system. You save time and money when you "shop" at Grinnell.

Take advantage of this *complete* piping service . . . call on Grinnell "whenever piping is involved".

GRINNELL OFFERS A COMPLETE PIPING SERVICE

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- Pipe, Valves and Fittings
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GRINNELL

WHENEVER PIPING IS INVOLVED

Helping hand for Pumping Stations . . . the complete CRANE Line

NUMBER ONE utility in town or city. Guardian of public health . . . foundation for community growth and development. That's the role of a modern waterworks . . . an exacting task for its piping equipment.

To do their job best, wise waterworks officials turn to an old helping hand: the complete Crane line of dependable piping materials. In valves as in fittings for every need, Crane Quality meets today's highest standards for water supply and distribution practices. Crane equipment in its pumping stations and streets means peace of mind and sound investment for a community of any size.

For, to equip with Crane wherever piping is used, is to gain this important 3-way advantage:

ONE SOURCE OF SUPPLY offering the most comprehensive selection of brass, iron, steel, and alloy piping materials for all power, process, and general services.

ONE RESPONSIBILITY helping you to get the best installation, and to avoid needless delays on the job.

ONE STANDARD OF QUALITY in every item, assuring uniform dependability throughout piping systems.

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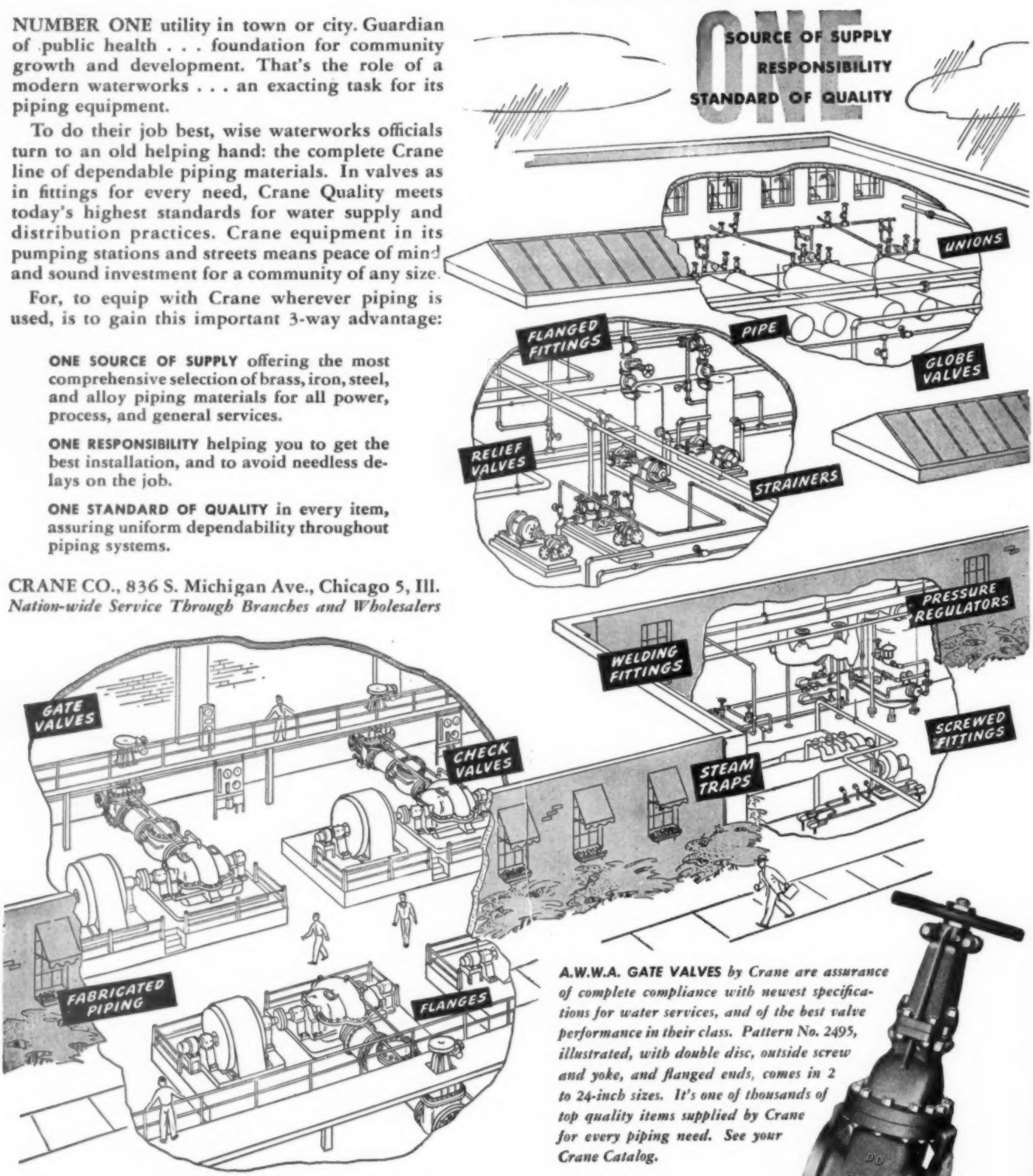

A.W.W.A. GATE VALVES *by Crane are assurance of complete compliance with newest specifications for water services, and of the best valve performance in their class. Pattern No. 2495, illustrated, with double disc, outside screw and yoke, and flanged ends, comes in 2 to 24-inch sizes. It's one of thousands of top quality items supplied by Crane for every piping need. See your Crane Catalog.*

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PIPE • PLUMBING
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"The Jig's up, Orgie. There's no hideout from

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Pipe lining machine entering 48" pipe, Philadelphia, Pa.

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Only PRELOAD Equipment can Produce PRELOAD Results - - -

Pipe lining surface equipment, Philadelphia, Pa.

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The PRELOAD Cement Pipe Lining Machine utilizes material which has been pre-mixed dry, above ground, and is conveyed to it under pneumatic pressure. The mixture is hydrated by water jets at the nozzle immediately prior to being "shot" against the pipe wall with a velocity of over 300 feet per second. The thickness of the cement mortar lining is closely controlled by special mechanism. The cement mortar lining is then smoothed by four graduated spring-loaded trowels attached to pantograph troweling arms.

The surface equipment is designed to operate with a minimum of disturbance to traffic and surrounding business and residential districts; is highly mobile and provides every facility for carrying forward the below-ground pipe lining operation with speed, efficiency, and economy.

PRELOAD Pipe Lining can give a new economic lease of life to old water mains 24" or larger; conserve and forestall capital investments in new pipe lines; improve service by increasing fire fighting, industrial and domestic water pressure; and create new water revenues through increased pipe line capacity.

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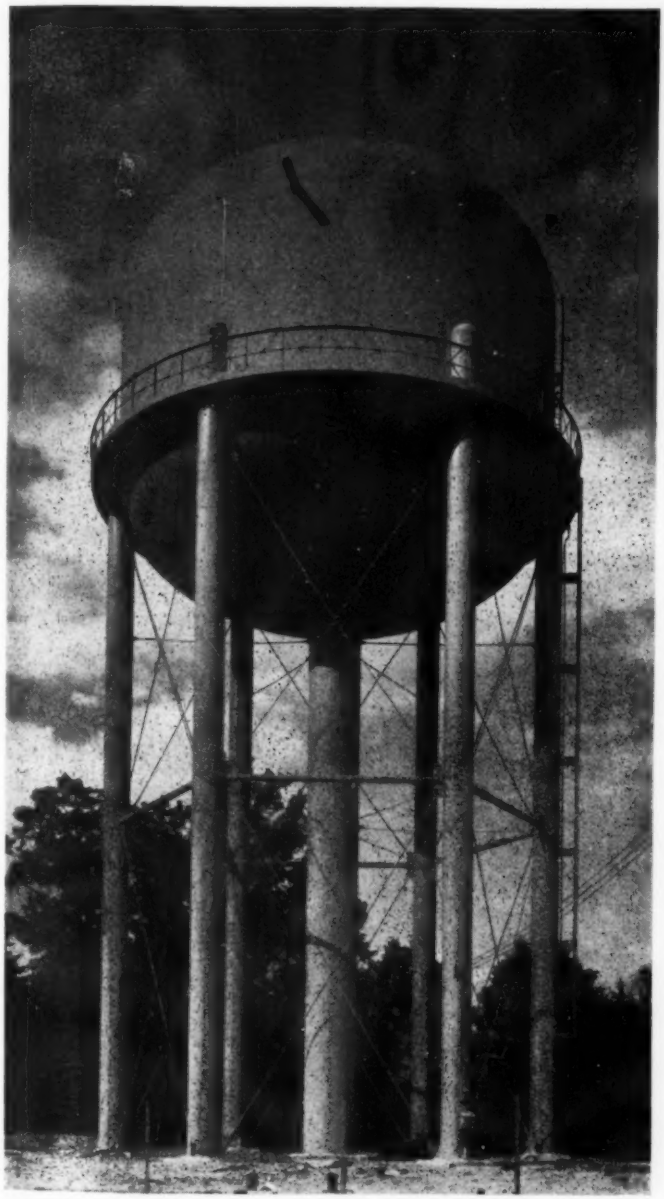
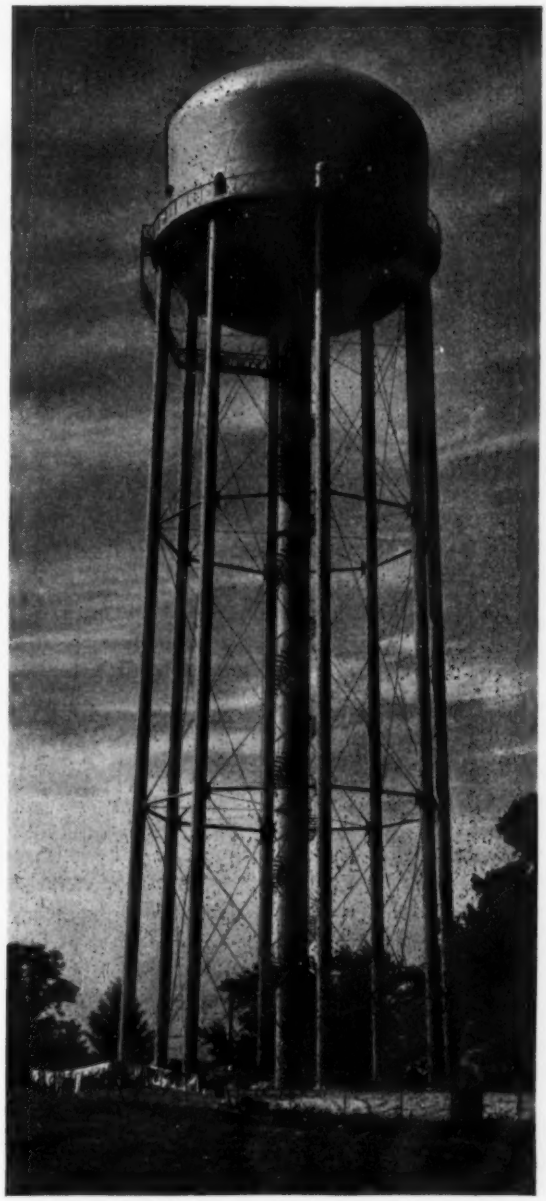
● We recently erected the two Horton elevated tanks shown on this page to help provide adequate water pressure, during period of high peak demands, in two suburban areas adjacent to Washington, D. C. The Washington Suburban Sanitary Commission, which operates the distribution system, also uses a 4,000,000-gal. Horton welded steel reservoir 151 ft. in diam. by 31 ft. high at Wheaton, Md.



HORTON ELEVATED TANKS



● *The one at the left, which holds* 500,000 *gals., is located at Glenmont, Md. Cylindrical columns were selected for these two tanks to give the structures an attractive, streamlined appearance and to make them easier to maintain. The tank shown above holds* 300,000 *gals. and is located at Forest Heights, Md.*

When providing water storage facilities for municipal distribution systems, get the advantages of Horton all-welded elevated tanks.

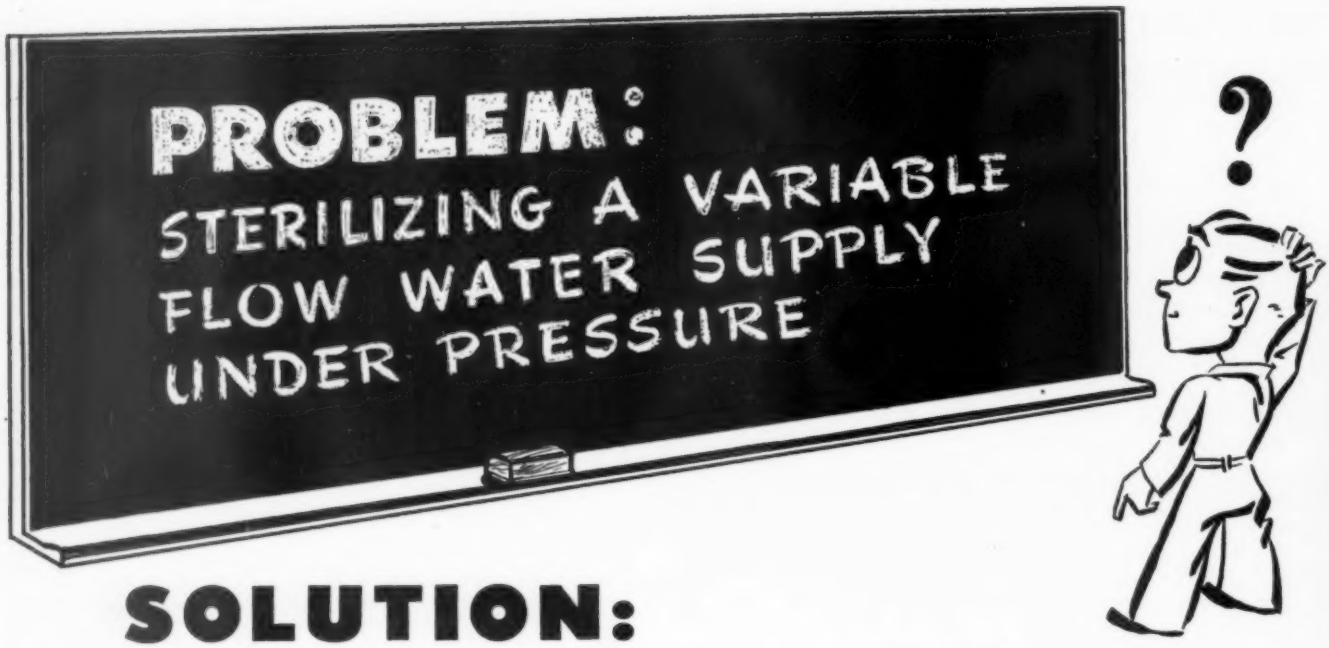
WRITE FOR QUOTATIONS

CHICAGO BRIDGE & IRON COMPANY

Chicago 4.....2198 McCormick Bldg.
New York 6.....3390-165 Broadway Bldg.
Cleveland 15.....2262 Guildhall Bldg.
Los Angeles 14.....1455 Wm. Fox Bldg.
Birmingham 1.....1586 North 50th St.
Atlanta 3.....2181 Healey Bldg.
Tulsa 3.....1646 Hunt Bldg.
Houston 2.....2115 National Standard Bldg.
Philadelphia 3.....1644-1700 Walnut Street Bldg.
Havana.....402 Abreu Bldg.
San Francisco 11.....1283-22 Battery Street Bldg.
Detroit 26.....1551 Lafayette Bldg.

Plants in Birmingham, Chicago and Greenville, Pa.

In Canada: Morton Steel Works, Limited, Fort Erie, Ont.



SOLUTION:

%PROPORTIONEERS% AUTOMATIC AND PROPORTIONAL CHEM-O-FEEDER!

Just install %Proportioneers% Automatic and Proportional Hydraulically operated Chem-O-Feeder and a standard water meter. It is only necessary to know the minimum, average, and maximum flow to be sterilized and the pressures against which the chemical will be injected. All flow is measured by the mechanical water meter and %Proportioneers% equipment starts, varies and stops dosage of chemical in step as the water comes on, fluctuates and tapers off. The %Proportioneers% Low Pressure Chem-O-Feeder shown is treating gravity water supplies against pressures up to 100 p.s.i. Installation is simple and our nearest sales and service representative will assist you in the selection of proper meter and equipment.

RESULT: Fully automatic sterilization of water supply, with chemical fed in strict proportion to flow, without dependence on electricity or other source of power. The only attention required is the occasional refilling of solution tank and checking the chlorine residual to adjust dosage for any variation in the chlorine demand of raw water.

CONCLUSION: Whatever your water treating problem, %Proportioneers% can help you; ask us for recommendations and quotations. Our experience from over 23,000 installations is at your service.

Write for Bulletin SAN-1.

% PROPORTIONEERS, INC. %

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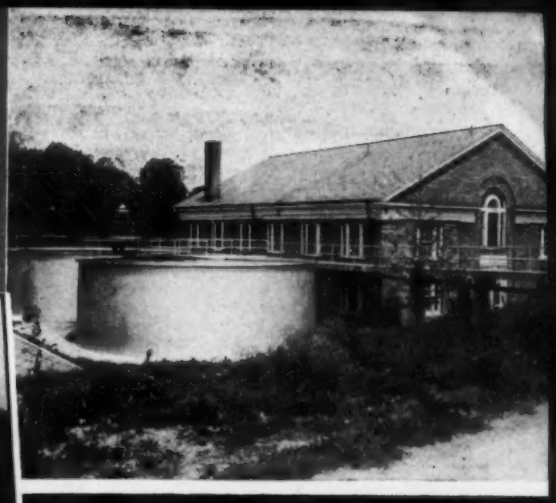
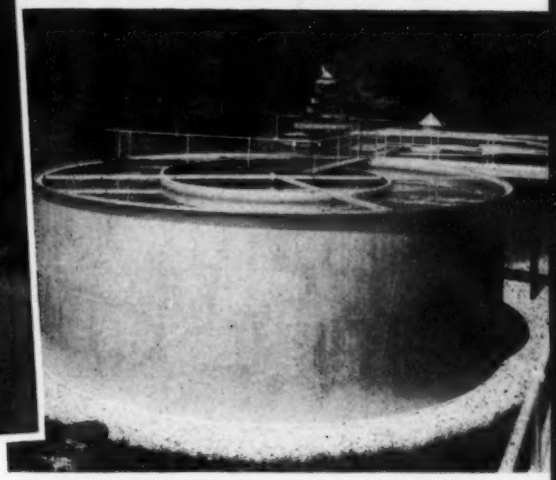
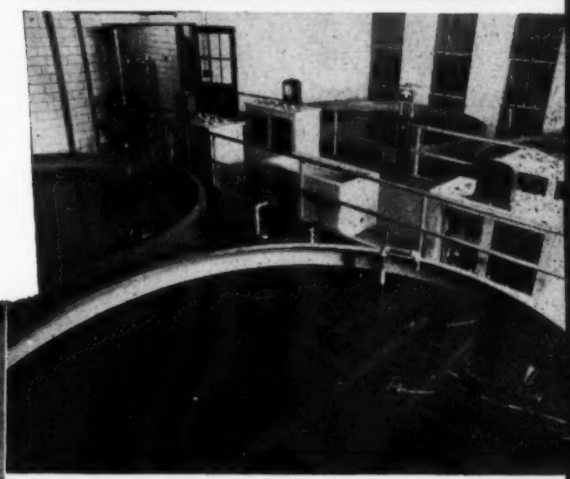
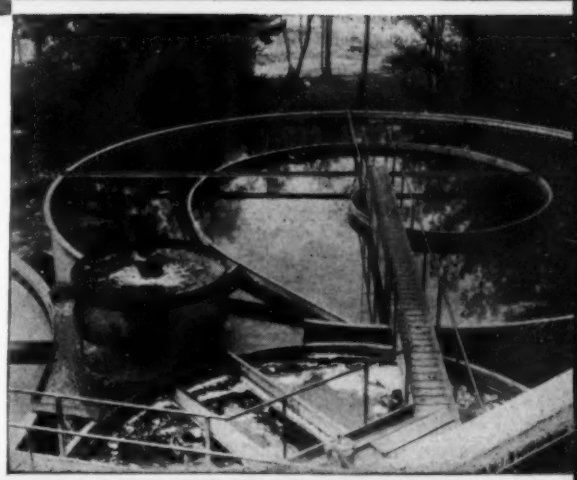
A permanent investment in efficient, economical Water Treatment Facilities





Steel Filtration Plants
by
Pittsburgh-Des Moines





The permanence of steel, employed for all water-handling equipment from intake point to elevated storage tanks, reservoirs or standpipes, is a modern advantage provided by Pittsburgh-Des Moines Filtration Plant design and fabrication.

We will be glad to consult with you on your water treatment project, and show you in detail the many features contributing to better performance and economy in P-DM Steel Filtration Plants. Write today, without obligation.

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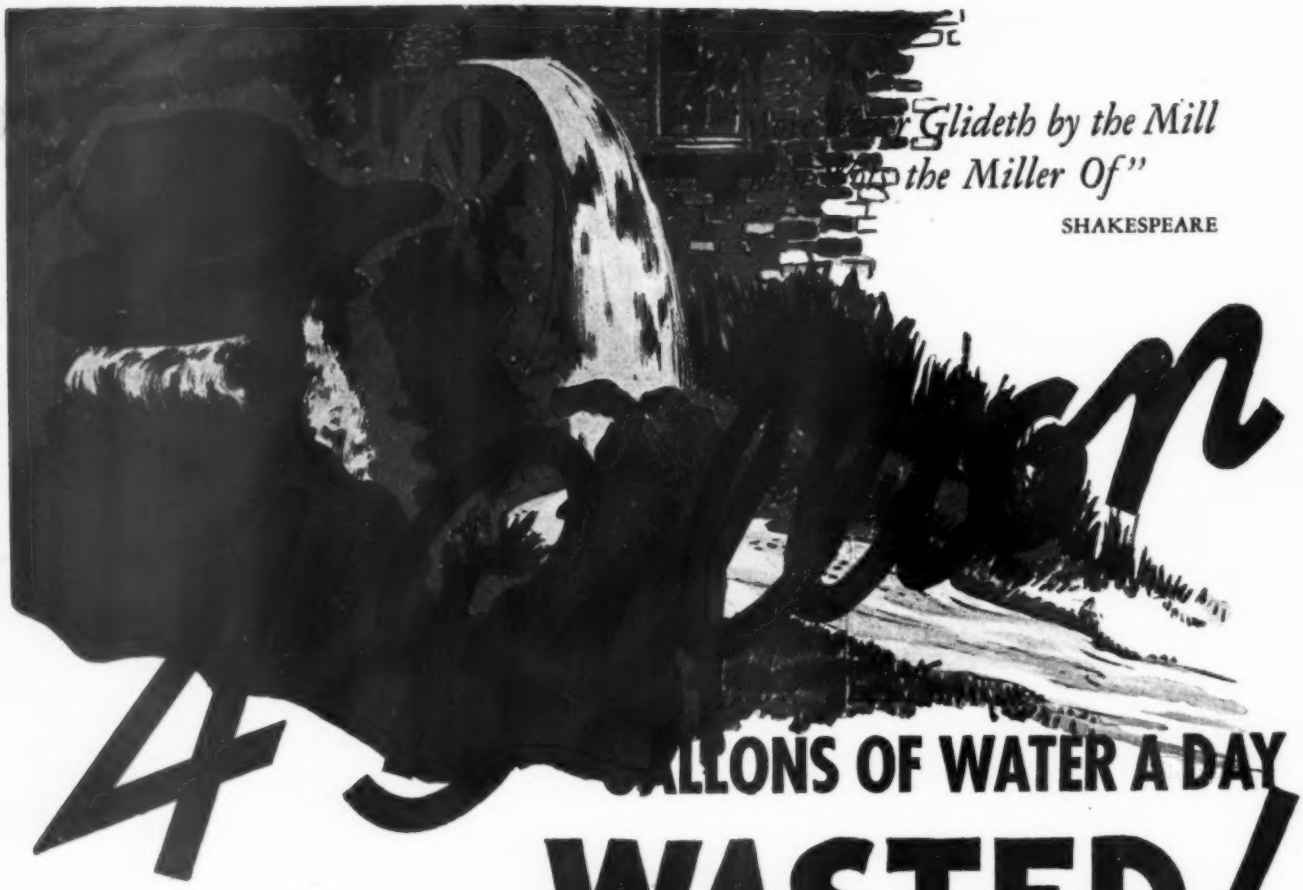


4 [illegible]LLONS OF WATER A DAY WASTED!

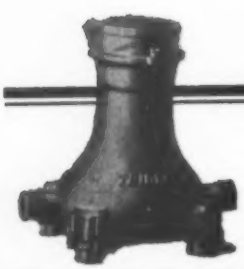
THE Water Plants of this country are needlessly pumping a combined total of FOUR BILLION gallons of water per day, most of which could be saved, if unaccounted-for leakage or waste was brought under good economic control. With water rates fixed, and water-processing and delivery costs soaring, such waste constitutes a serious financial problem.

Consider the total amount of chlorine and coal that is needlessly used DAILY to treat and to pump this tremendous DAILY wasted gallonage. If all public water supply systems were to make an effort to reduce unaccounted-for water you can imagine the total possible saving in such factors alone.

Reports from numerous cities show that such a program will also result in increased revenue, through a better accounting for water pumped into the distribution system. Records prove that one of the most effective ways to minimize needless pumpage is systematic inspection, testing and repairing of water meters, especially the smaller sizes which have been in "operation" without attention for a number of years.

Your Trident representative will be glad to help you start a meter testing and repair program.

183



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WATER & SEWAGE WORKS

VOL. 95, NO. 1 JANUARY, 1948

A Gillette Publication

THE WATER WORKS INDUSTRY IN 1947

Happenings and Developments of the Year in Retrospect

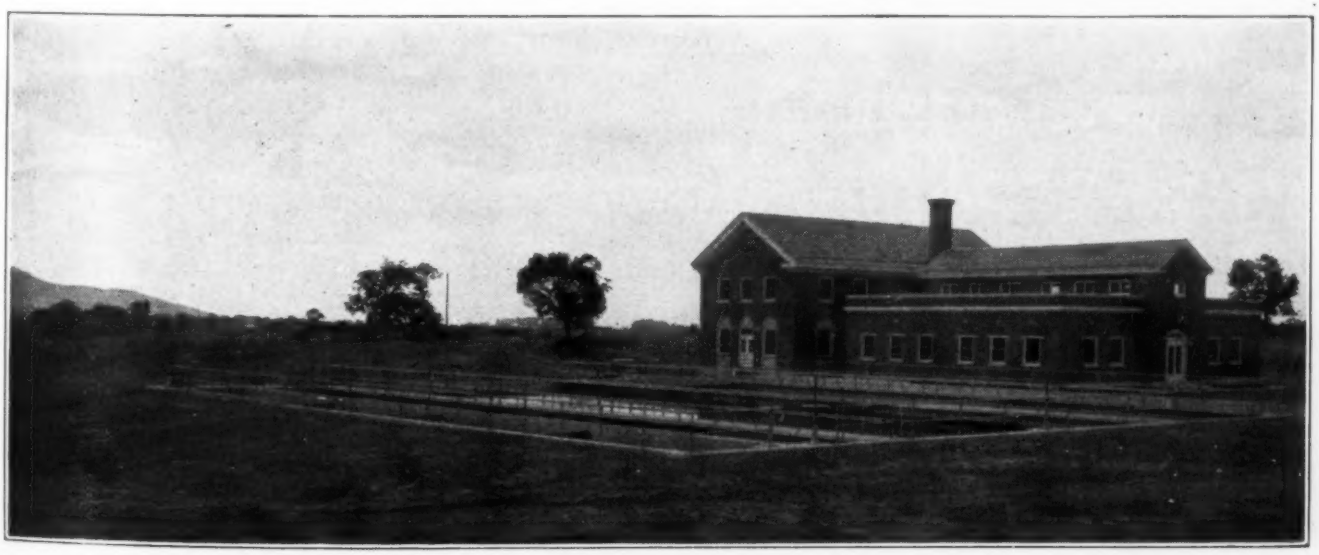
By N. T. VEATCH
Partner
BLACK & VEATCH, ENGRS.
KANSAS CITY, MO.
(*President of the American Water Works Association*)

DEVELOPMENTS in the water works field during 1947 have been mainly along lines of general policy, rather than new processes, technical details of equipment, etc. It is probable that 1947 will be remembered by water works men as a year of unusual handicaps even when compared with the periods of the world wars.

The Author

Progress in Construction

Progress in new construction as well as in maintenance was remarkable only in the light of the difficulties encountered as the amount of work actually accomplished was far short of the urgent needs. The costs of construction rose steadily throughout the year and both labor and materials continue in extremely short supply. In spite of adverse conditions, several notable projects are being constructed. At Chicago, the world's largest filter plant went into operation. This plant includes 80 units, each of which may be operated at rates up to 8 mgd. and will furnish filtered water for approximately half of the city. At Savannah, Georgia, a project which includes nearly 80 miles of 48 in. steel supply line and 35 mgd. of filter capacity is well underway, and it is reported that the Saginaw-Midland project in Michigan, for which contracts totalling more than $10,000,000 have been awarded, is being constructed at the rate of $1,000,000 per month. Construction work on the supply from the Delaware River has been resumed by the City of New York and several other notable projects are in the construction stage.



The New 6 M.G.D. Filtration Plant of Roanoke, Va.
One of the very few new plants to be put into service in 1947 delivers soft mountain water to a happier Roanoke.

As a matter of fact, construction projects of various magnitude are being pushed as rapidly as possible in practically every city of the country, but the total amount of work actually placed under contract for construction during 1947 is alarmingly low when compared with the needs of the country.

A country wide survey made by the United States Public Health Service and released in July, 1947, outlines the need for water works improvements totaling some two billion dollars. A portion of these needs has been placed under design through the help of the Bureau of Community Facilities of the Federal Works Administration. This program, which was discontinued on July 1, consisted of loaning money to communities for the preparation of plans for water and sewage works (among other facilities), with the loan to be repaid to the Federal government when construction begins. More than 2,150 communities received loans for the preparation of plans for more than 2,600 water and sewage works projects costing well over a billion dollars. Of this amount perhaps 35 per cent will be water works projects. Just as the amount of work planned falls well below the projected needs for water works construction, so too does the actual construction fall well below the value of the projects under design.

The amount of water works construction actually placed under contract during the past three years, as reported by the *Engineering News-Record*, is approximately $296,258,000, as follows:

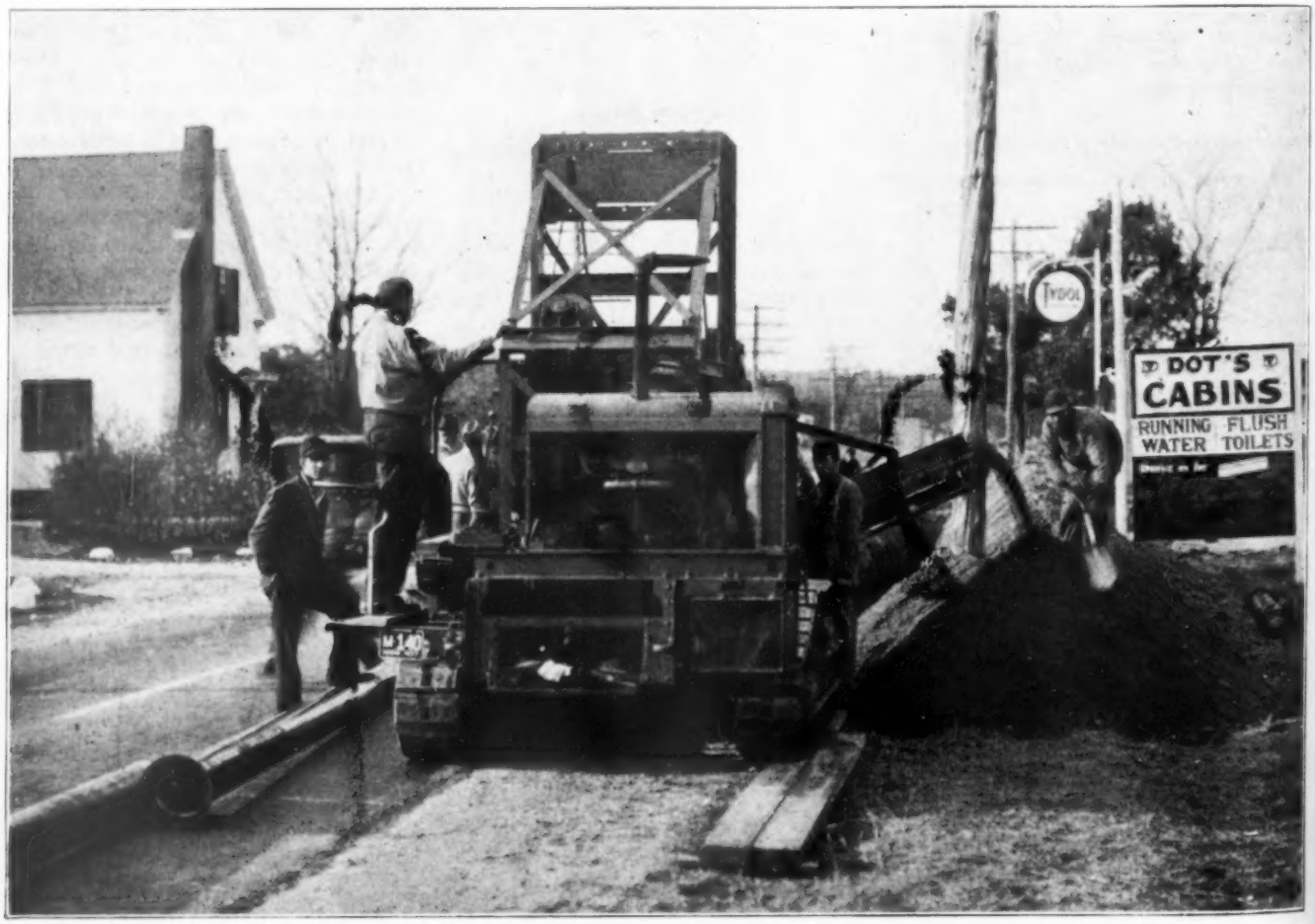
1945—52 weeks	$ 61,039,000
1946—52 weeks	109,226,000
1947—First 48 weeks	125,993,000
Total	$296,258,000

It is evident, therefore, that the total of contracts let during the past three years represents about one-seventh of the total that may be needed. It is believed that the causes of the large amount of work now needed are:

1. The desire for water service by communities which heretofore have not had a public supply. The number of communities is quite large but the total cost of the improvements needed is relatively low for the reason that most of the communities are small. However, we find a trend toward development of more Sanitary Districts or Water Districts serving numerous small communities. Also, note is taken of the development of country Water Departments such as that of DeKalb County in Georgia, which has proved the practicability of such developments.

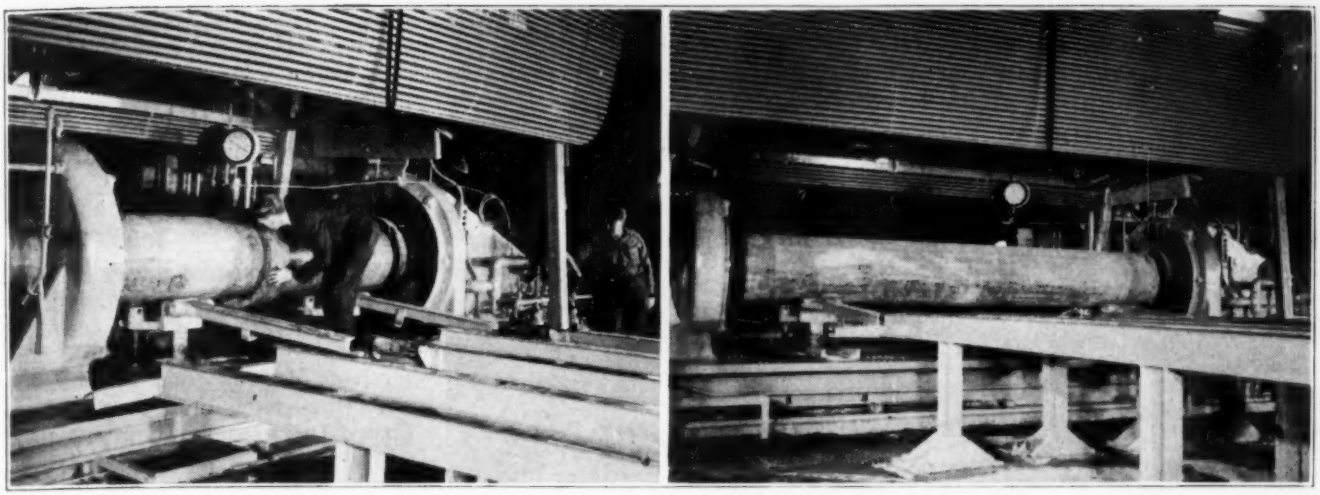
2. The accumulation of maintenance items which have been deferred because of short supply or high cost. In the aggregate, deferred maintenance is an impressive item at the present time since in many cases it dates to the depression years and has not been reduced by the makeshift practices necessary during the years of war effort.

3. The relatively rapid growth of cities during and immediately after World War II. It is probable that this growth is responsible for the major portion of the need of water works improvements now apparent. A recent census in the State of Missouri showed increases from 10 to 30 per cent in the counties which contain cities of 10,000 or more and losses up to 10 per cent in the counties which are essentially rural. It is probable that this condition is



Mechanical Trenching Speeds Pipe Laying and Reduces Cost

Portland, Me., has dug trench and installed as much as 1,500 ft. of pipe in one day with this Barber Green trencher.



Winnipeg, Canada, Tests Transite Pipe After 14 Years' Service
Hydrostatic pressure tests show no deterioration of pipe strength. On left: Test of Simplex coupling and pipe assembly. On right: Test of 13 ft. sections of pipe

general over the country and is a logical reason for the rather unexpected sustained demand on water supplies during the past two post-war years. This movement of population from rural to urban areas is one reason for the housing shortage and for unusual increases in water consumption.

4. The tendency of cities to grow by development of new areas rather than by increase in density of population. This tendency is evidenced not only by the development of areas within the city limits but also by that of suburban areas which in the course of time will usually be taken into the city. Water service is a necessity in either case and the effect of growth by expansion is that the water service to the increased population involves the extension of the distribution system as well as the production of more water.

Cost of Construction

The cost of construction as indicated by the index published by the *Engineering News-Record* has increased approximately 12.4 per cent during the period from January 1, 1947 (index 381.68), and December 1, 1947 (index 429.30). That is to say, the work which in 1913 would have cost $1.00 would have cost $3.82 at the first of 1947 and can be expected to cost $4.29 in December, 1947. The index in July, 1945, was 308.99 and therefore, calculated percentage-wise, the index at present (i.e., 429.30) is approximately 39 per cent higher than that at the end of World War II.

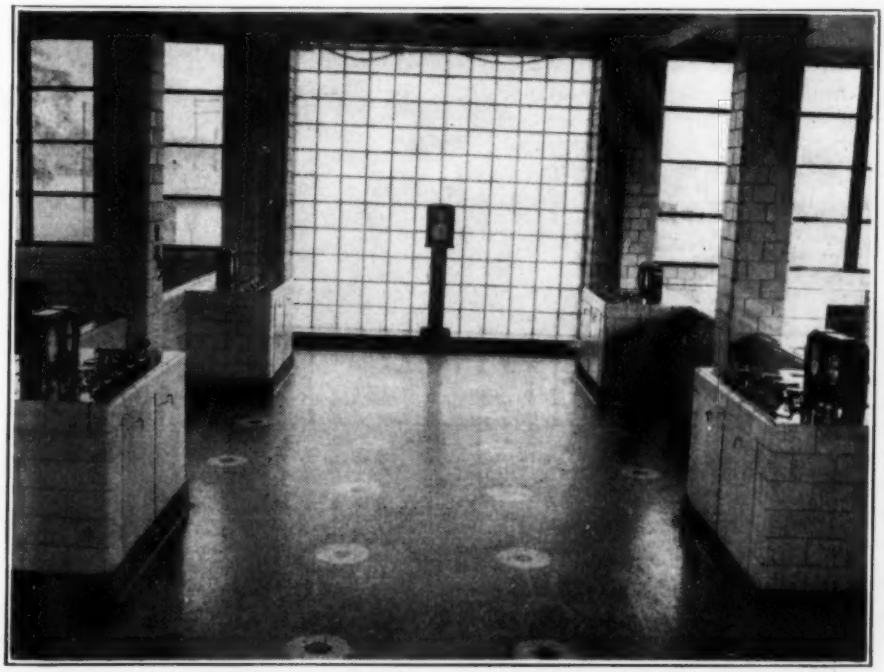
It is interesting to note that in November, 1918, the index was 193.55 and that it increased more or less regularly for 19 months until it reached a peak of 273.80 in June, 1920. The increase at the peak was 41.5 per cent, or slightly more than the current increase.

In view of the difference in conditions as between the two periods, no conclusion may be drawn from the foregoing facts but it is comforting at least to know that current construction costs may be near a peak so far as the record is concerned.

[It is interesting to note that in late November, while speaking before the Four-States Section of A.W.W.A. in Washington, D. C., Francis S. Friel, consulting engineer and immediate past president of the Federation of Sewage Works Assns., predicted that construction costs would reach a level perhaps 65-75 per cent above the pre-war level and that thereafter it might be expected that construction costs would drop to somewhere between 55 and 60 per cent above the pre-war (1939) levels and stabilize at this point.—Ed.]

Technical Progress

Technical progress was seemingly below normal during 1947 and the adoption of new processes and equipment was necessarily slow, due to difficulties in procuring materials and equipment, and partly at least for the reason that operators, in general, were unusually busy and had little time for experimental work.



Interior of Filter Gallery, Midland, Penna.
(One of the few new plants)

Marshalltown, Iowa's New 1,000,000 Gal. Capacity Tank
This tank is 84 ft. 3 in. in dia., with a head range of 25 ft. and a supporting tower 129 ft. high.

Plants had to be kept in operation in spite of increased demands for water and an increasing amount of overdue maintenance.

On the other hand, there were certain advancements worthy of noting. Terminology for use in respect to chlorination reached a stage of standardization, and Griffin and Chamberlin reported that the determination of residual chlorine in its different forms and by different methods can now be done with more certainty as to what the analytical results mean. A manual on the "Use and Handling of Chlorine" was issued by the Chlorine Institute, thus bringing together in one book the best information available on the subject. This is a book that should be in the hands of every water and sewage works superintendent.

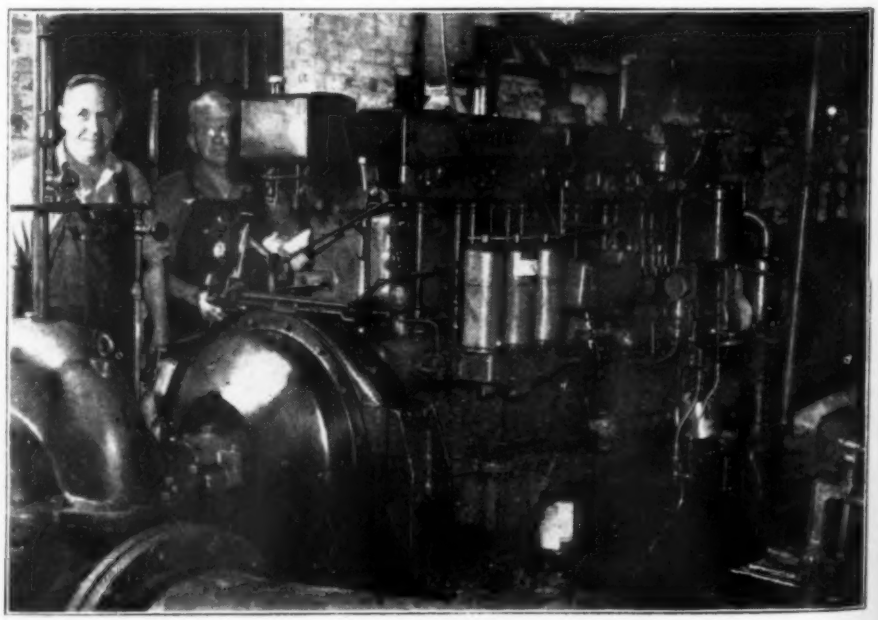
The use of chlorine dioxide as a means of taste and odor control continued to expand and several studies were made not only of the chemical characteristics of this reagent but also of its bactericidal effect and its effect on the polio virus. These studies were published in various technical journals.

Taste and odor control continued to receive attention by other methods and several new ideas for distribution of either activated carbon or copper sulfate in reservoirs were published. One of the books published during the year dealt with this subject of taste and odor control. Other books published during the year were of the text book or reference variety on the design and operation of treatment works, etc.

A new method of lining cast iron pipe in place, known as the "Eric" process, was introduced into this country from England, and other methods of lining pipe as a means of restoring pipe line capacity continued to be employed in a number of large cities, with new developments of certain types of equipment for cement lining to permit the lining of smaller mains than heretofore was possible.

The subject of disinfection of water mains after installation or repair was up for discussion at many sectional water works meetings and a committee of the A.W.W.A. continued its work on the development of a proper method of disinfection which will soon be released by the Association.

Two other subjects caught the attention of the water works industry during the year. Both of these were discussed in formal papers at the annual A.W.W.A. convention in San Francisco. These topics were the pollution of ground waters and the reclamation and use of sewage effluents. Both topics are of vital interest from the standpoint of conservation of resources, and both may be expected to continue to warrant attention of water works personnel. Wastes from water treatment plants,



Taunton, Mass. Augments its Supply with a Caterpillar Diesel Driven 6 mgd. Pump

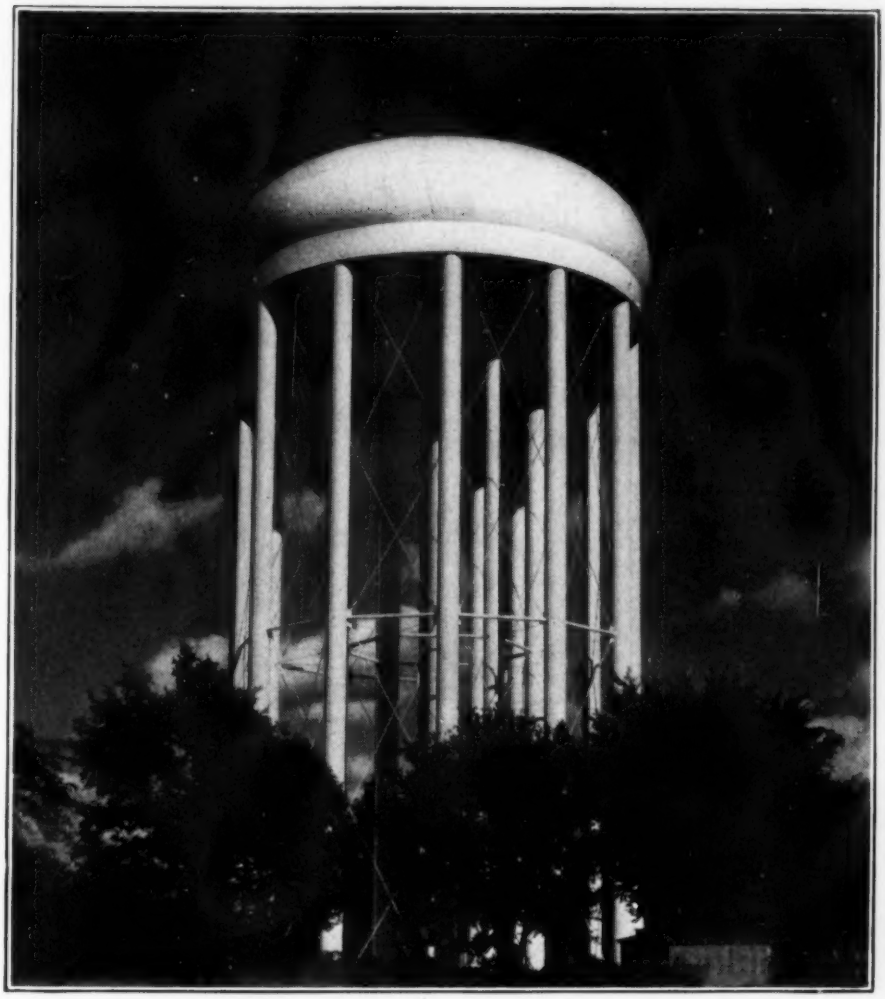
particularly brine from zeolite softening plants, sludge from sedimentation basins, lime sludges from softening plants, and filter washings received attention from various writers and it is probable that these wastes will receive more attention in the future.

Fluoridation

Several excellent articles have appeared during the year on "Mass Medication" in general and fluoridation of water supplies in particular. At the end of the year ten or more communities were adding fluorides to the water for the purpose of controlling dental caries and several others were contemplating the treatment. The one large controlled experiment in New York state, at Newburgh, N. Y. (Kingston as the control), has indicated some benefit, although the experiment has eight more years to run in the contemplated ten year study before observations can be considered conclusive.

Although all of the communities now using the fluoride treatment add the material as a salt, Madison, Wis., is planning to add the fluorine as hydrofluoric acid. It was also in Wisconsin, at Sheboygan, where inauguration of the fluoride treatment was accompanied by the adoption of a city ordinance which transfers all responsibility, except that of proper control of treatment, to the City Health Department.

The final answer to this question of fluoridation has not been determined, and the best thought at this time seems to indicate the need for caution and procedure only under instructions of the local health authority.



Spheroidal Design Elevated Tank at Columbia, Mo.
Capacity, 1,000,000 gallons; it is 134 ft. to the bottom.

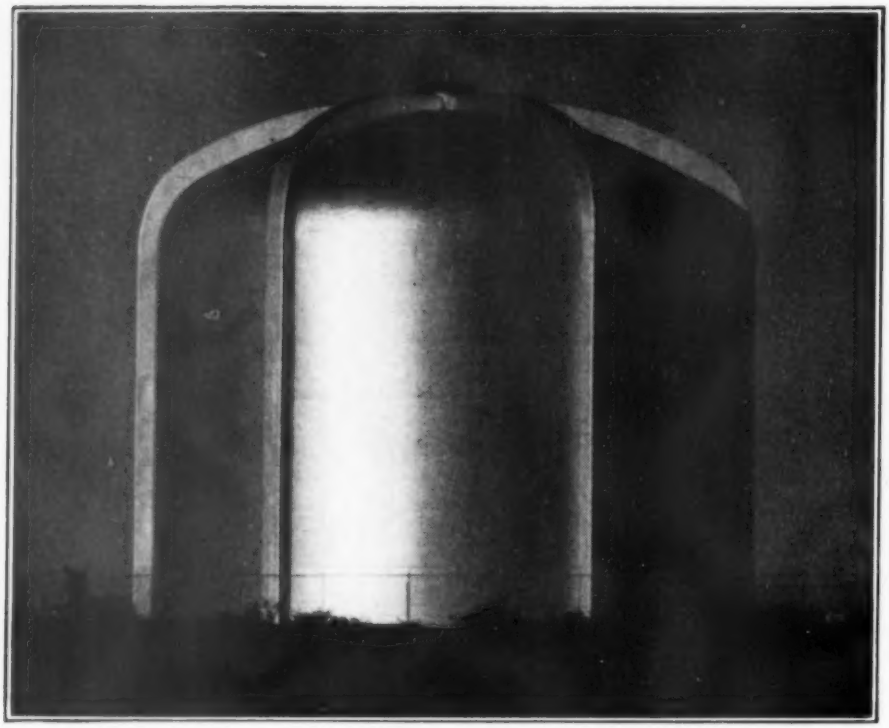
A.W.W.A. Progress

Characteristic of the American Water Works Association's vibrant growth of the last several years, this year saw an increase in membership which at the year's end is rapidly approaching the 7,000 mark. This growth was due not only to the efforts of the executive secretary's office of the association, but also to the individual work of membership chairmen in various sections.

The following new sections came into being — Alabama, Mississippi, Missouri, Nebraska, and Iowa—and all of these sections showed immediate growth of membership in the geographical locations covered. Steps have also been taken which will result in the formation of a Pennsylvania State Section out of the Western Pennsylvania Section and that part of Pennsylvania which is at present in the Four-States Section. This action will not be complete until next year.

At the end of 1946 the ninth edition of "Standard Methods for the Examination of Water and Sewage" was published jointly by the American Water Works Assn. and the American Public Health Assn., and this standard text became available early in 1947. It is characteristic of the care and thought that enters into the preparation of this work that, simultaneous with its appearance,

Rugged Copper Sulfate Distributing Craft Developed at Augusta, Me.
(Crew is at operating positions.)



Midland, Tex. Has a New 2,200,000 Gal. Reservoir
(80 *ft. diameter and* 51 *ft. high*)

committees of the American Water Works Assn., the American Public Health Assn., and the Federation of Sewage Works Assn. started on the long and tedious job of getting out the tenth edition, which will be published in a few years.

For the first time in the history of A.W.W.A. this Association held a concurrent convention with the Federation of Sewage Works Associations. This meeting was held in San Francisco in mid-July. Although some difficulties developed out of this method of concurrent meetings, there is no doubt that the innovation resulted in the largest display of manufacturers' equipment yet seen at an A.W.W.A. convention and the attendance at the convention topped all previous records, in spite of the fact that the locale was so far from the center of the majority of water supply systems.

Beckman Portable pH Meter

Public Relations

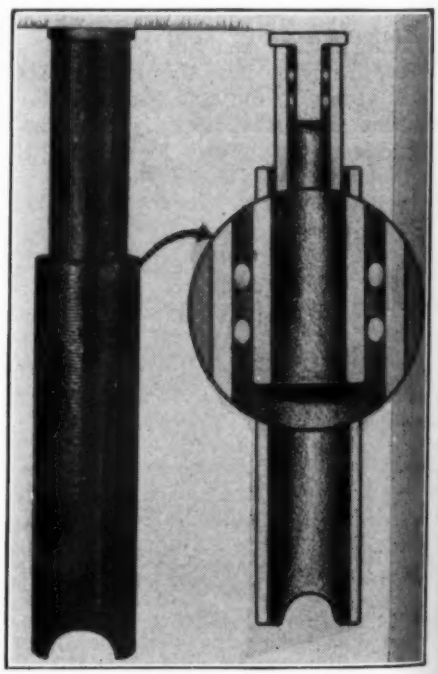
Personnel troubles were unusually frequent, due to the somewhat higher wage scales currently offered by industry in general and to the fact that the unsettled condition of labor extended to the crews engaged in operation and maintenance work. In several states, laws were passed forbidding the striking of public employees. The implications that such laws eliminate the possibility of work stoppage in the all important public water utility does not relieve either the management of that utility or its workers from their responsibilities to the public or to each other as human beings. The need for cooperative understanding and teamwork continues to be a paramount consideration of both, and adequate salaries and retirement plans must continue to receive attention. As a matter of fact, the events of 1947 tend to emphasize the fact that now is an excellent time for the industry to "get its house in order" to meet the challenge presented by the apparent and urgent need for more water and the unsettled conditions in the field of construction.

A basic step in this direction has been taken by the American Water Works Association in its program toward better public relations and it is believed that this is the logical approach to the important matter of financing operation and improvements. This program includes more than that. Through six releases on the subject of Public Relations during 1947 the A.W.W.A. has brought to the water works superintendent and operator not only the need for public relations because of the responsibilities of the utility management and labor, but the program has also shown the value of good public relations, why the public should be informed and various methods of disseminating that information as a means of creating the desired type of public relations.

Rate Increases Necessary

This matter of public relations is important if water utilities are to face the possibility of increasing rates and revenues to meet increasing costs. It appears that to meet the current costs of operation and maintenance, it will be necessary to increase revenue and that the amount of the increase needed is in the order of 30 per cent. Naturally, no serious objection may be expected from the public if it understands that the increased revenue represents increased cost and nothing more. On the other hand, if this cannot be demonstrated conclusively, the increase is certain to be unpopular.

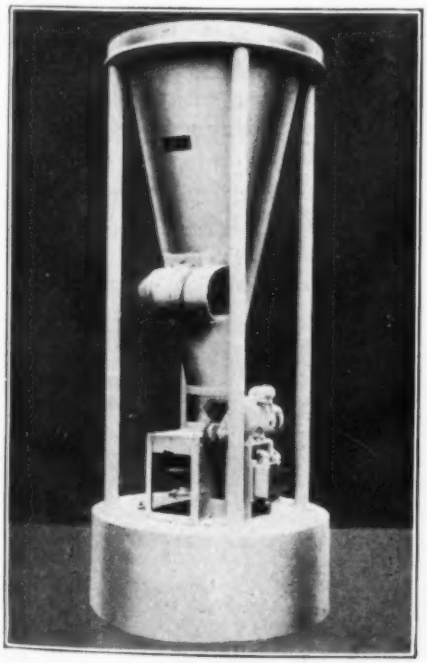
It would seem that two steps should be taken by water works management. First, the actual financial condition of the system should be ascertained through accurate accounting, and secondly, the facts so



The "G-H" Shock-Proof Corrosion-Proof Curb Service Box
(Invention of C. S. Greutzmacher and O. A. Halvorson, of the Milwaukee Water Dept.)

ascertained should be presented to the public in a form that is easily understood. This will require a change in accounting methods for a large number of systems and it is believed that the management of these systems can do no better than to follow the manual of accounting prepared jointly by the American Water Works Association and the Association of Municipal Finance Officers. It would seem advisable that the installation of the system of accounting set out in this manual be made under the supervision of an expert accountant, but it is believed that when once installed and in service, the system will be found to be quite simple and eminently worth while.

While on this subject, it seems pertinent to ask why would it not be desirable for all concerned to follow the lead of Maine, Wisconsin, California, and possibly other states, and place the operation of municipal water systems under regulatory utility commission control similar to that which for privately owned utilities is obligatory. In numerous instances this would mean more realistic bookkeeping but it is at least conceivable that books so kept could be shown to the public with complete confidence. It would seem that realistic accounting can provide the answer to the question raised editorially by Linn Enslow in connection with an advertisement of a reduction of rates for electric service (see *Water & Sewage Works*, February, 1947, p. 80). The question was, "In the face of such publicized rate reductions by one utility, what explanations can the water works manager most effectively offer in his argument for higher rates for the product of a sister utility—the water utility?"



Permutit's Dry Chemical Feeder

Britain's Coldstream Guards Battle the River Lea to Save London's Water Supply

It is at least conceivable that the utility in question has ascertained, through accurate accounting, that its revenues could be reduced. At least the utility was fully aware of its own financial condition and took advantage of an excellent opportunity to better its public relations. It so happens that this question was adequately answered in the Enslow editorial quoted from above and this viewpoint is intended to be supplementary rather than controversial.

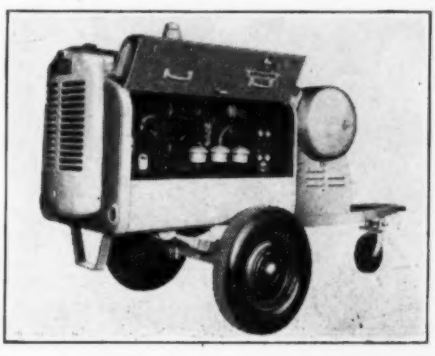
Stream Pollution and Control

The increased general interest in pending federal legislation for the control of stream pollution is another important development of the year. This subject will no doubt receive attention in the regular session of Congress next year. At the present time it appears there is a reasonable expectancy of getting a law passed that will retain State control, assure cooperation between State and Federal agencies, and eliminate the most objectionable features which have appeared in most of the bills proposed earlier.

During the year an article appeared in one of the leading women's magazines, entitled "Foul—But You Drink It," in which the need for abatement of stream pollution was presented in feature writing style. The article contained many good arguments for cleaning up our streams, but at the same time utilized what could properly be called fear propaganda, which unfortunately raised the question in a good many minds regarding the quality of the water being used in a number of cities. All water works men are interested in better stream conditions, but naturally resent statements that intimate to their customers that they may be drinking foul or "reclaimed" water, and bring back to mind those times when suspicion of the supply was created by a product not altogether pleasing to the palate or the nostrils.

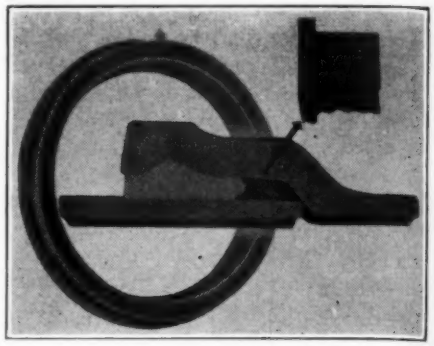
Inasmuch as there are many other valid reasons for urging the public to demand abatement of stream pollution, it seems unnecessary to create suspicion regarding water supplies where facts over many years have shown them to be safe and having

Le Roi Airmaster Compressor



Hydrauger Portable Boring Tool

LaMotte "D.M." Test for Algae Control



Smith-Blair Joint Packing

met the U. S. Public Health Service Standards for Drinking Water.

The State Water Commission of West Virginia has submitted its report on that part of the watershed of the Ohio River within the boundaries of the State of West Virginia. The several streams are classified as to the desirability for (a) water supply, (b) fish life, and (c) recreation, and are graded as excellent, good, poor, and unsuitable. Tolerances as to bacteria and chemical substances are stated and it would seem that this report is a useful guide for the determination of the extent of water treatment required as well as for the determination of the extent to which tributary sewage and industrial wastes must be treated.

Disaster

Probably the most appalling single disaster during the year occurred at Texas City, Texas, following the explosion of a ship carrying ammonium nitrate. Not only was death and destruction widespread, but the water and sewage systems were materially damaged. Only by shipping in water along with medicines and supplies was an epidemic prevented. It is a tribute to the engineers and chemists, as well as to the medical profession, that the disaster control committee functioned so wisely in these matters.

Across the Atlantic Ocean floods harrassed the English people in the spring of the year and one severe flood on the Lea river shut down the important Lea Bridge Works of the Metropolitan Water Board of London for nine days. Water was dispensed to consumers from re-drafted wartime truck tanks and mutual aid plus supply interconnections were a great help in alleviating the conditions.

Here in this country, floods, hurricanes and fires all caused damage. Some of the Mississippi River cities experienced the difficulties of flooding during the early months of the year and in the Fall severe forest fires in Maine and elsewhere wiped out whole towns and villages and crippled many water supplies.

New Equipment

By and large, the new equipment introduced during the year 1947 was small in quantity and had no important aspect with regard to established water treatment or distribution practices. For the most part the new equipment was confined to auxiliary equipment and improvements therein. Several of these items are well worth mentioning.

A shock-proof and corrosion-proof curb box, invented and developed by Clarence Greutzmacher, Engr. of Distr., and Otto Halvorsen, Asst. Mech. Engr. of the Milwaukee Water Dept., was placed on the market—first by Pilot Engineering Service of Milwaukee and more recently by Verako Products Co. of Waukegan, Ill.

A combination, corrosion resistant, plug-gate valve was announced by the Crane Co. of Chicago, and the A. P. Smith Manufacturing Co. developed a new lead gasket having raised preformed ribs for use on bolted tapping sleeves.

For small water treatment plants and swimming pools, %Proportioneers% made available a "Pur-O-Cel" diatomaceous earth filter, while the Wallace and Tiernan Co. offered the "Mini-Filter" and "Aqua-Tabs" for hunters and campers.

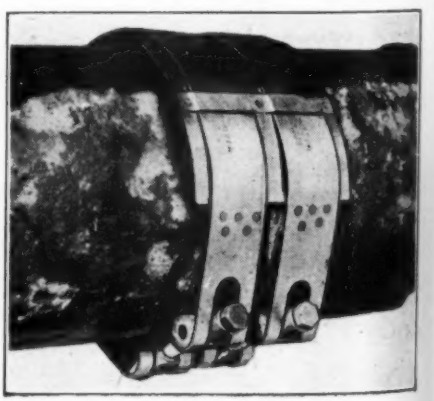
For boring holes in the earth for service pipe installations, the Hydrauger Corp. of San Francisco introduced a one man portable unit, and Payne Dean introduced a portable gate operating mechanism called the "Gatetender."

New laboratory equipment included the "D. M." test rack for determin-

The Payne Dean Gatetender

A. P. Smith Co.'s Bottle-Tight Ribbed Lead Gaskets

Marman Products High Pressure Clamp



W & T's New Dry Feeder

ing the proper copper sulfate dosage for algae control (LaMotte Chemical Products), and apparatus by Wallace and Tiernan for determining the various forms of residual chlorine by titration with the Amperometric Titrator.

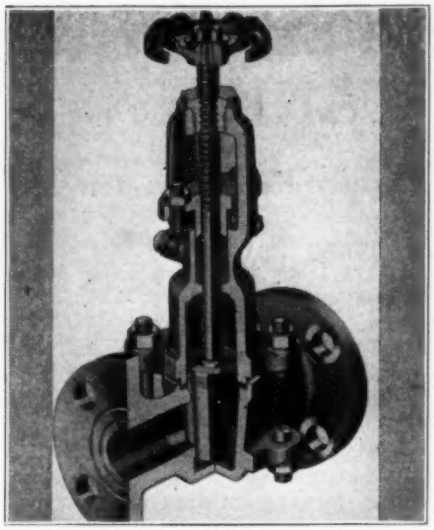
New dry feed equipment included one by Permutit and one by Wallace and Tiernan. Other new items were a new self-adjusting, self-locking joint packing for pouring wet or dry bell and spigot cast iron pipe joints (Smith-Blair), a new pipe and cable locator by Wahlquist, and a new type of compound meter produced by the Challenger Manufacturing Co. of San Jose, Calif.

Other new items of interest to water works men include the new Fairbanks-Morse Axial Air-Gap Motor, pressure clamps for stopping leaks in pipes, new models of air compressors, some of which are attached to a service truck with power takeoff; and various small portable pumps, including a midget aluminum pump by Gorman-Rupp.

Miscellaneous

The year 1947 witnessed the first routine use of a heliocopter in the water works industry when one was used by the Western New York

Fairbanks-Morse Axial Air Gap Motor



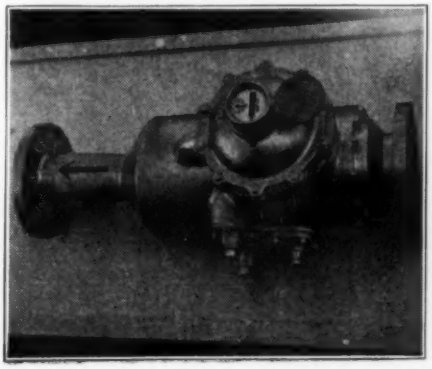
Crane Co. Plug-Gate Valve

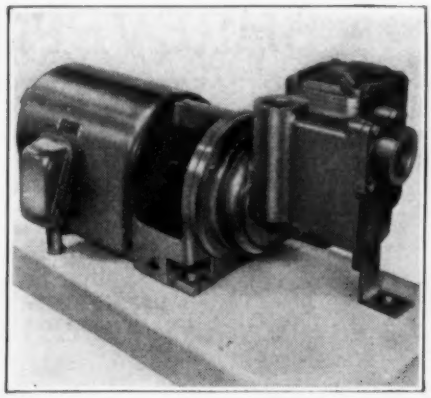
Water Co. for the collection of water samples from Lake Erie. The machine, which is provided with pontoons, took off from the settling basins, flew to a point outside the breakwater where the water is often too rough for small boats, hovered over sampling points while samples were collected, flew back to the plant and settled down in the settling basin. Valuable time was saved. [Possibilities of the heliocopter in stream surveys and sampling programs seem worthy of some attention.—Ed.]

The possible deleterious effects of wastes from atomic piles was discussed, it being pointed out that this might become a serious problem as the study and adoption of atomic power continued.

The problem of chlorine supply was emphasized on several occasions. In spite of the increased production of chlorine by the manufacturers of that product, the amount of chlorine available to the sanitary engineering field is not always ample and has caused considerable anxiety to some water utilities where chlorine supply has run dangerously low before new

Challenger's Novel Compound Meter



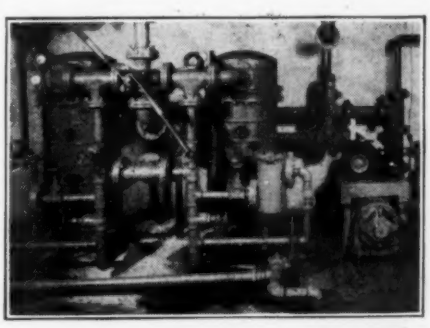


Allis-Chalmers' Self Priming Centrifugal Pump

shipments arrive. This fact results from the tremendous increase in the use of chlorine in the chemical industry, plus the fact that there continues to be a short supply of shipping containers. Whereas ten years ago chlorine for water and sewage treatment amounted to more than 11 per cent of the total chlorine produced, today the chlorine consumption for these uses is but little over three per cent of the total chlorine production even though the amount of chlorine used in water and sewage treatment has in the meantime reached more than 50,000 tons a year total usage. Other factors such as variability of demand by seasons and distance of consumers from producing points all tend to make this problem of sufficient and dependable chlorine supply one of vital concern to the water works industry.

In retrospect, 1947 was a somewhat eventful year for the water works industry in spite of the handicaps due to economic conditions. In the face of the difficulties of construction during the past two years and the fact that the needs of the country for additional water facilities seem to be staggering, it is believed that the water works industry will take this challenge "in its stride" and that few, if any, homes now reported to be in need of adequate water service will actually suffer.

Proportioneers' Pur-O-Cel Filter



SHREVEPORT'S NEW WATER TANK

Effectuates a Triangular Supply Feeder System

By THOMAS L. AMISS
Sup't.-Engr.
DEP'T. OF WATER & SEWERAGE.
SHREVEPORT, LA.

The Author

THE purpose of the new elevated tank of Shreveport is to reinforce the weak parts of our distribution system, which supplies a high valued residential area located on high elevation and, at the same time, to serve in balancing off the entire distribution system.

This 2,000,000 gallon tank accumulates its storage from the surplus water during the lean consumption period at night and reinforces the system during heavy consumption in daytime hours by feeding the system from the side of the city opposite the two pumping stations. It floats on the system, smoothing off the pressure and relieving the system of shocks brought about by direct pressure pumping. The effect of the tank floating on the system is realized within a five mile radius from its location, reflecting an increase of one to four pounds pressure at this distance. However, the full value of the tank has not yet been realized because we have not completed an additional 24-inch cast iron main, now in the process of construction. The 20,560 feet of new main runs direct from the tank to Cross Lake Pumping Station. This main will reduce the friction head loss by more than 40 feet. Even now, though, the effects of the equalization of pressure over the system has been beyond my expectations. When the 24-inch feeder main and the other sub-mains are completed the full pumping economy can then be obtained.

Shreveport's New 2 MG. Elevated Tank
Second highest tank of such size. Overflow line 135 ft. above ground and empty line 100 ft. above ground level.

Triangular Supply

The tank is located in the southern portion of the city, 6 miles from the McNeil Street Pumping Station and 5 miles from the Cross Lake Pumping Station. These two stations have a capacity of 13.0 and 8.0 mgd., respectively, and are tied into the distribution system at two points 3 miles apart with 16-inch and 20-inch interconnected mains.

It can be seen that the Shreveport system is now strategically designed in that the two pumping stations and the tank form a triangle and feed the distribution system from the three points of the triangle.

Make-up of the City

Before picturing to you the features of the tank I will give you some information concerning the city. The population proper of the City of Shreveport is 115,000, but the metropolitan area served with water has a population of 132,000. Shreveport's area is nearly 20 square miles. The topography ranges in elevation from 30 to 125 feet and 239 feet above Gulf level. A distribution system of 276 miles serves the citizens through pipe sizes ranging from 2 to 30 inches, while 1,204 fire hydrants serve fire protection to

most of the city. At this writing, a minimum pressure of 50 psi. is maintained at the highest points with the new tank on the system, and pumping at 15,000,000 gpd. meeting all water requirements.

I am very proud to be able to say that Shreveport is 100 per cent metered with no substituted wartime materials used in the makeup of the meters. A total of 24,659 accounts constitute our inside city metered service.

Features of the Tank

The 2,000,000 gallon elevated steel storage tank is, I am advised, the second highest tank of such capacity in the country. Its height is 100 feet from the ground or foundation to the bottom capacity line and 135 feet to the overflow or upper capacity line. It is 102 feet in diameter. Its bottom is of the fluted radial-cone design. It is supported by a central riser pipe 10 feet in diameter and 16 cylindrical columns 42 inches in diameter each. The outer supporting columns are set back 10 feet from the outer circumference of the tank, carrying the entire load directly under the tank with cross connected 1¼ inch rods tying the entire structure solidly together. An 8 inch overflow pipe, receiving the water through a funnel shaped top piece, is carried down through the riser pipe to the ground level, where a connection is provided to dispose of the overflow to a storm sewer.

The top is ellipsoidal in shape, gracefully formed to suit the radial-cone fluted bottom and structural beam supports, an octagonal shaped finial (vent) tops the structure. A cluster of lights on top of the finial serves as a beacon to warn airplanes of its position, and red lights are provided around the balcony railing to further warn air travel. This is an all welded job except, of course, the turnbuckles on rods and the foundation bolts. In other words, it is a solidly constructed structure assembled and built in place and when completed and filled proved to be bottle tight—not a drop of leakage.

Cathodic Protection Provided

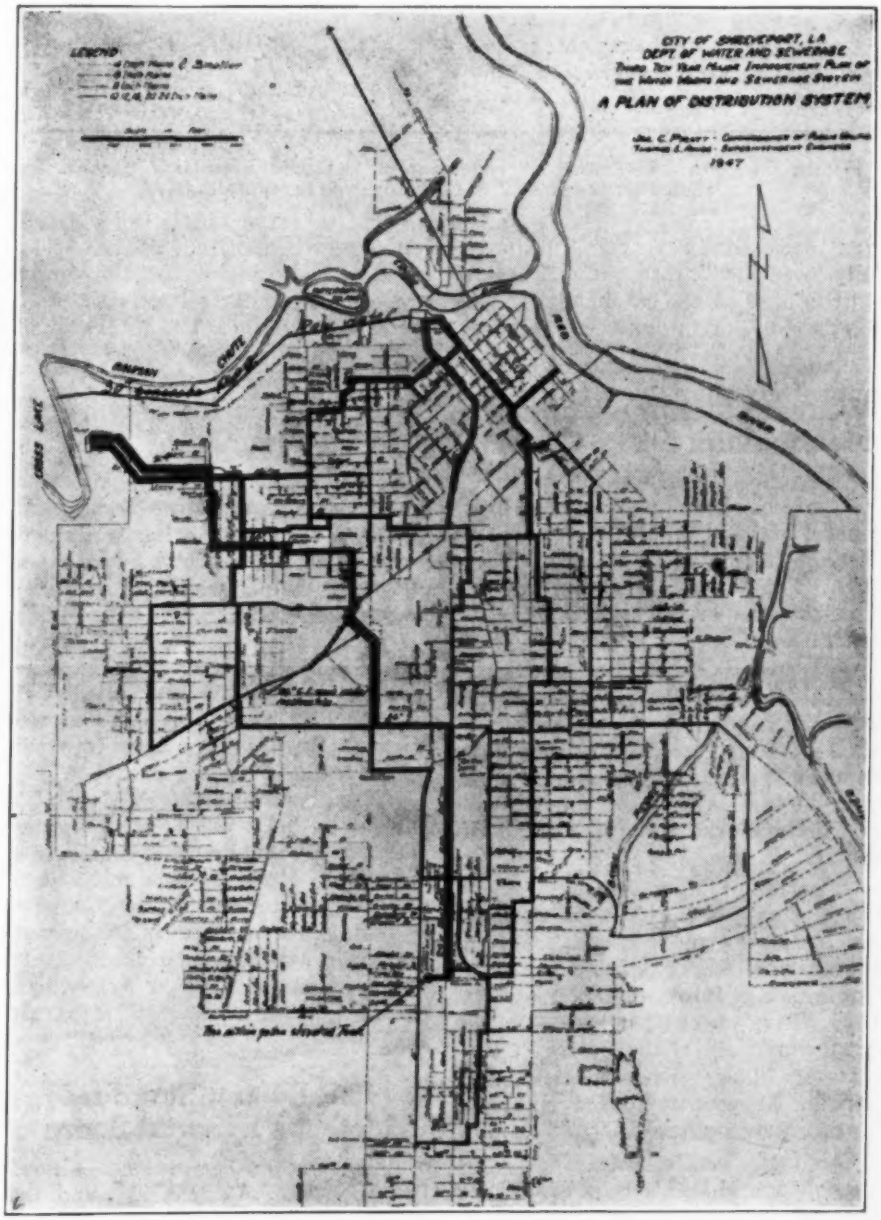
The painting consists of two coats of red-lead applied with a spray gun and finished in aluminum. This silver finish blends beautifully against Shreveport's strikingly blue skyline. The inner surface of the tank is painted with two coats of red lead.

The protection employed against corrosion, in addition to painting, is cathodic protection, which I think will serve as the secondary line of defense against corrosion should some defects later appear in the red lead protective coating as the primary line of defense.

The accompanying sketch shows that in the Shreveport installation, for the 2 m.g. tank of 102 foot diameter, not one anode but 12 anodes are being used to insure more positive protection to the tank walls and the 10 foot diameter riser pipe.

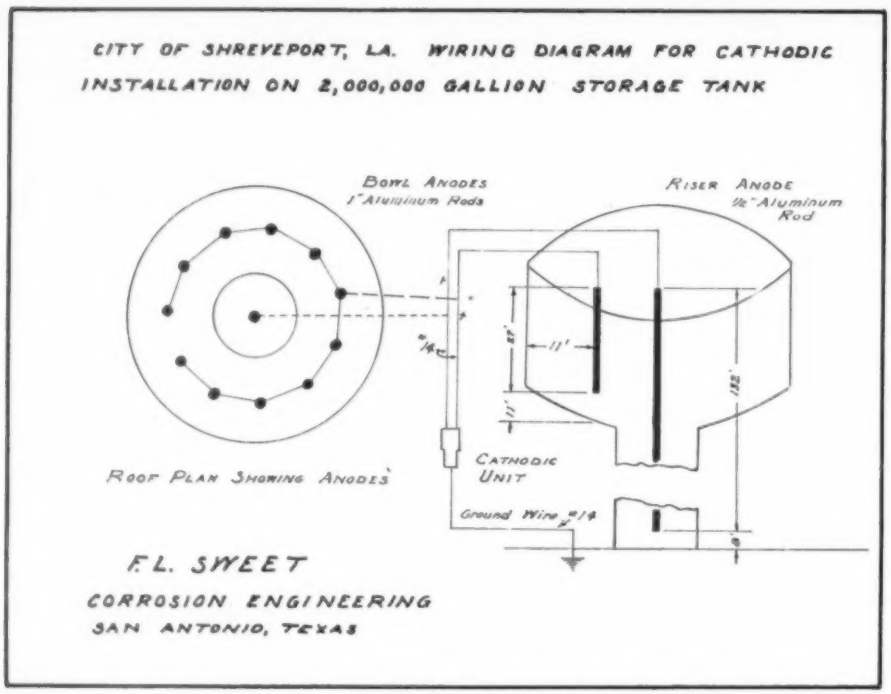
In the center of the tank one anode 132 feet long hangs from the roof and extends down in the riser pipe to within 5 feet of its bottom for the purpose of giving this unit protection. On a circle 11 feet inside from the tank walls are 11 anodes, 27 feet in length each, suspended from the roof and terminating 11 feet from the tank bottom. All electrodes extend 3 feet above the flow-line to insure against wetting of the anode connections and possible shorting out of any of the electrodes. The 132 foot anode protecting the riser pipe is made of ½ inch aluminum rod. The other 11 anodes are of 1 inch aluminum rod.

Current is supplied from the nearby domestic electric line and is converted to direct current and controlled through a Cathodic Rust Proofing Super Unit supplied by F. L. Sweet of San Antonio, Texas. This is a unit with full-wave rectifiers and transformers of the oil immersion



Shreveport's Distribution System 1947

This plan, showing location of the new 2 mg. tank on the south side of the city and the new trunk mains under construction, represents the third of three major 10 year water supply and sewerage improvement programs for Shreveport.


CITY OF SHREVEPORT, LA. WIRING DIAGRAM FOR CATHODIC INSTALLATION ON 2,000,000 GALLION STORAGE TANK
Bowl Anodes 1" Aluminum Rods
Riser Anode ½" Aluminum Rod
Roof Plan Showing Anodes
Cathodic Unit
Ground Wire #14
F.L. SWEET
CORROSION ENGINEERING
SAN ANTONIO, TEXAS

Wiring Diagram and Anode Arrangement in Cathodic Protection System Installed on the New 2 M.G. Tank at Shreveport, La.

type enclosed in a metal cabinet fully weather protected. A pilot light located on the cabinet indicates whether or not the unit is functioning. The weatherproof cabinet is located outside on one of the tank's supporting tubular columns about 15 feet above ground. The total cost of the cathodic protection was $1,400 for the equipment installed and $500 for the electric wiring.

Costs—

The following represents the cost breakdown:

Foundation	$ 56,000
Tank and Erection	156,000
Cathodic Protection	1,400
Wiring	500
Complete	$213,900

From the above it is seen that the cathodic protection installation, including all wiring, cost less than 1 per cent of the entire cost of the tank.

The material and erection contractor was the Chicago Bridge and Iron Company of Chicago, Ill. The foundation contractor was the Flenniken Construction Company, Inc., and the electrical wiring contractor was Frank Camus and Son, Electrical Contractors, both of Shreveport. The cathodic protection was supplied by F. L. Sweet of San Antonio, Texas, and Charles B. Foster, Jr., was the supervising engineer for the city. The Honorable Joe C. Pratt is Commissioner of Public Utilities of the City of Shreveport.

Wurts to Manage Hartford Metropolitan Distr. Comm.

Assistant City Engineer Wm. A. O. Wurts has been appointed the first general manager of the Metropolitan District, Commission of Hartford, Conn. This appointment represents the first step in the District's reorganization.

Mr. Wurts, as General Manager for the Commission at a salary of $10,000 per year, is in charge of all of the District's activities formerly handled by separate divisional heads such as the manager of the Bureau of Public Works and the Bureau of Water.

A native of Hartford, Mr. Wurts is a graduate of Rensselaer Polytechnic Institute, where he taught civil engineering before joining the City Engineering Dept. of Hartford in 1925. Five years later he was made deputy manager of the District's Bureau of Public Works from which position he was appointed manager of the Metropolitan District Comm.

Caleb M. Saville, long time manager of the M.D.C.'s Bureau of Water, and Robert J. Moss, manager of the Bureau of Public Works, are expected to resign shortly, but will be retained as consulting engineers of their respective bureaus.

Water Bonds for Sewerage Financing?

New York City officials have been instructed to study the legality of financing the construction of six new sewage treatment plants by issuance of water supply bonds. Mayor O'-Dwyer has stated that in his opinion "it is an obligation of the Board of Water Supply not only to bring pure water to New York City, but also to see that it is reasonably freed of pollution before it goes back into the public waters."

If the plan advocated by Mayor O'-Dwyer is held to be legal, water users would pay for the purification of sewage through this method of financing rather than through a sewer rental charge. Charges for sewage treatment would appear in the form of an increased rate on water used rather than as a new and separate tax.

10th Edition Standard Methods Editorial Board

According to agreements signed by the A.W.W.A., A.P.H.A. and the F.S.W.A, sponsorship of the "Standard Methods for the Examination of Water and Sewage" will, in the future, include all three of these organizations.

The editorial board for the 10th edition has been completed and consists of MacHarvey McGrady, Chief of Laboratories, Quebec Ministry of Health, Montreal, Que., for the A.P.H.A.; Harry A. Faber, Research Chemist, The Chlorine Institute, Inc., New York City, for the A.W.W.A.; and William D. Hatfield, Supt. Sewage for the Sanitary District of Decatur, Decatur, Ill., for the F.S.W.A.

Hayse Black Becomes Professor at Univ. of Iowa

The University of Iowa in Iowa City, Ia., has announced the appointment of Hayse H. Black as associate professor of sanitary engineering in the Dept. of Civil Engineering.

Black comes to the University of Iowa from Detroit, Mich., where he has been the Officer in Charge of the U. S. Section, International Joint Commission Boundary Water Pollution Investigation.

Prior to that assignment, Mr. Black was with the Corps of Engineers from 1942 to 1946, where he served first with the Engineer Board, Fort Belvoir, Va., and later in technical intelligence in Tokyo, Japan. From 1934 to 1942 Black was senior sanitary engineer with the Illinois Dept. of Public Health, Springfield, Ill.

HYDRAULICS FOR THE PRACTICAL WATER WORKS MAN

The Thirteenth of a Series of Articles

Measuring the Flow in Streams

By ROBERT W. ANGUS, M.E.*
Consulting Engineer
TORONTO, CANADA

*(*Prof. Emeritus of Mechanical Engineering, University of Toronto)*

IN the previous article flow in open channels was discussed and the formulas used in connection with such channels were explained. The methods described there were those very largely used for the design of such channels but they are not employed much for finding the discharge of existing streams. The Chezy formula would be accurate for such a purpose if it were possible to get correct values of **n, r** and **s** but it is particularly difficult to select a good value of the coefficient of roughness, and frequently it is by no means easy to get a good average value of **r,** because, in many streams, the shape of the cross section varies considerably. Finally since the slope is usually small considerable proportional errors in the measurement of it are possible.

Perhaps the best reason of all for not using a formula is that there are convenient direct methods of measuring the discharge and some of these methods will be briefly described. Where the stream is a small one the simplest method of all is to set up a rectangular or a V notch weir in the way described in connection with them in Article XI. For the larger streams such a method is generally expensive and often impracticable, but with the smaller channels a temporary dam with a weir in it is conveniently and cheaply made and a complete record of the stream is easily kept by taking readings on the head as frequently as desired. The construction of the dam and weir will always raise the water level above them and this sometimes causes objectionable flooding.

A plan and an average cross section of a stream are shown on Fig. 46 and these must be carefully plotted to scale for any case to be examined; on this same drawing two cross sections a considerable distance (usually at least 100 ft.) apart are selected. The part of the stream between these must be as

The Author

straight, uniform and clean as possible and with the water flowing in straight lines down it. The drawing of the middle (mean) cross section A is next divided into a series of vertical strips of equal width, the number of these depending upon the judgment of the individual and the accuracy desired, but there should not, in general, be less than five of them. The area of each of these strips is then determined by any of the usual methods such as dividing the area up into a number of small squares of equal size and counting the squares. In the drawing there are five such strips, of areas A_1 to A_5 square feet, and the sum of these is, of course, equal to the total area of the section, which is A square feet. Having completed this part of the work the next thing is to try to determine the mean velocity of the water in each of the strips and if none of the expensive equipment, such as a current meter, is available the common practice is to use floats often made of rods (rod floats) and at other times of light boards which will float on the surface of the water.

Rod Floats

Where the stream is deep these are the most reliable type of all. They are made of light, dry wood with a weight at one end to make them float nearly vertically, but sometimes light tin pipes are used, closed at one end and loaded with stones or sand to bring them down to the desired depth. Bottles are often used in the shallower streams, weighted in the same way as the tin pipes are. On the plan (Fig. 46) dotted lines have been drawn corresponding with the divisions in the cross section, and with these as a guide a float is set in the stream at such a point as a and loaded so as to float as near to the bottom as possible without catching. The distance **L** ft. between the two cross sections having previously been measured, the time **t** sec. taken for the rod to float from the upper to the lower section is observed and the mean velocity of the float is readily calculated by dividing **L** by **t.**

In general the velocity of the float rod differs from the mean velocity of the water for several reasons. In the first place the rods cannot float very close to the bed because the latter is usually rough and uneven, and the rod must be kept high enough so that it does not catch at the shallowest point. Since

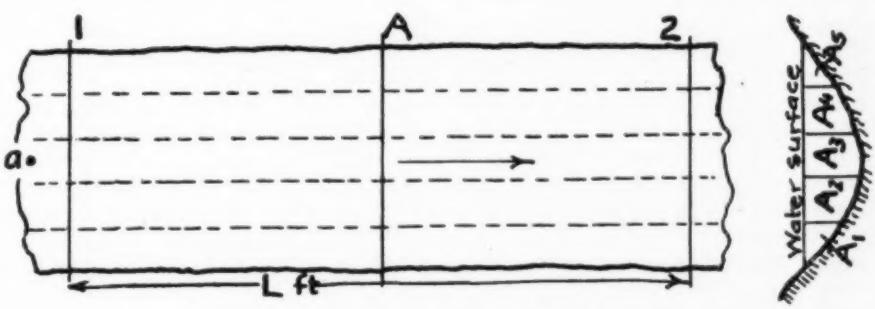


Fig. 46. Plan and Section of an Open Stream

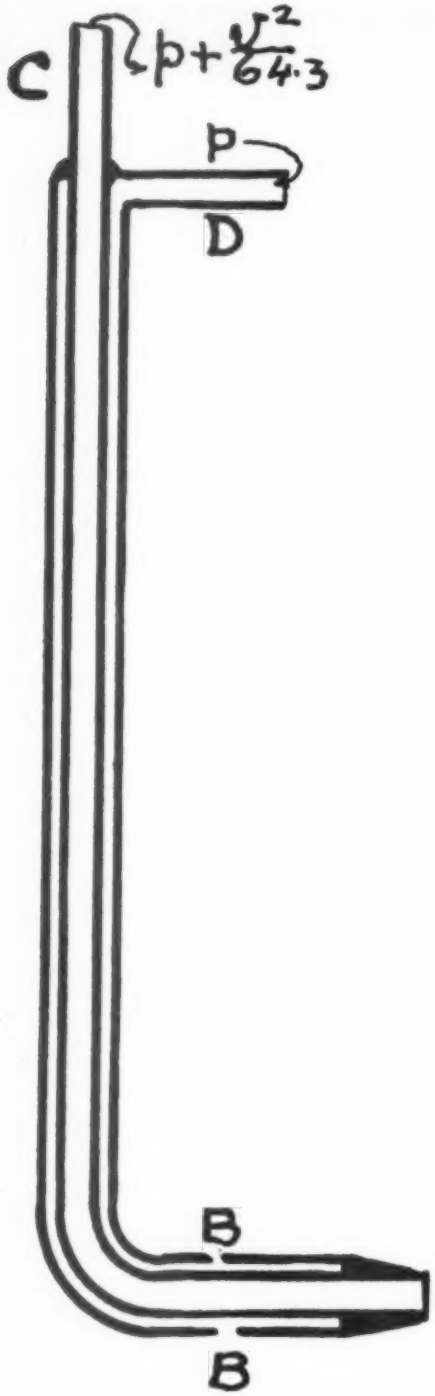


Fig. 47. Simple Form of Pitot Tube

the velocity near the bed is obviously lower than that higher up the float has a tendency to travel about five to ten per cent faster than the mean water velocity. Then again air resistance affects it and it must not project much above the surface, and finally it has a tendency to wander from one strip to another on its downward path. The float, however, gives very good satisfaction under favorable conditions and is very extensively used where better methods are not available. The mean velocity in the strip is quite close to ninety-five per cent of that of the float rod usually.

Surface Floats

These are commonly made of pieces of plank light enough to float on the surface but they should project as little above it as possible because they may be seriously affected by winds or air movement. They are used in exactly the same way as rod floats but are not as good as the latter because they are affected only by the surface currents and do not attempt to share the average velocity in the strip. As a rough average value it is fair to assume that in the ordinary stream the mean velocity in the vertical strip is not far from ten per cent above that shown by the surface float. At best they are not very reliable.

For any of the float methods the total discharge of the stream is, of course, the sum of the discharges in the several strips, and if the areas of the strips are denoted by A_1, A_2, A_3 etc. and the mean velocities in these strips are v_1, v_2, v_3 etc., respectively, then the total discharge is

$$Q = A_1v_1 + A_2v_2 + A_3v_3$$

etc. in cubic feet per second. The measurement of the discharge of a stream, or stream gaging as it is called, is a tedious and long process, requiring good judgment on the part of the observer, and it is necessary to make sure that the rate of flow is not varying while the measurements are being made. At some selected point a stake should be driven down into the bed till the top of it is flush with the water surface so that any variation in depth may be observed. Should such variation occur the work must not proceed.

The Pitot Tube

In Article II reference was made to the Pitot tube and its use in measuring the discharge of fire streams, but as its application has been quite extensive, particularly in water works surveys, it will be well to describe it more in detail. Its practical application covers a period of over 200 years.

Two forms of the instrument were shown in Figs. 13 and 14 but these were only suitable for streams at atmospheric pressure and in which the pressure in the tube indicates the velocity head only. If either of these tubes was inserted into a pipe line under pressure, such as a water works main, then the gage attached to it would read the sum of the pressure and velocity heads as was pointed out in Article II. To get the velocity head alone some method would have to be taken of subtracting the pressure head, and the above mentioned article has pointed out why this cannot be done with accuracy by subtracting the reading of a pressure gage attached to the wall of the pipe from the reading of the gage on the tube of Fig. 13 and 14. A special form of tube is always used on pipes under pressure.

One of the simplest of these forms is shown in Fig. 47 and is made of two brass tubes bent as shown, the tubing being of as small a size as will be strong enough to withstand pressure and shock. There is sufficient clearance between the inner and outer tubes to allow free passage of water and the entrance of the tube is usually fairly sharp. From what has been said the inner tube is under pressure due to the sum of the pressure and velocity

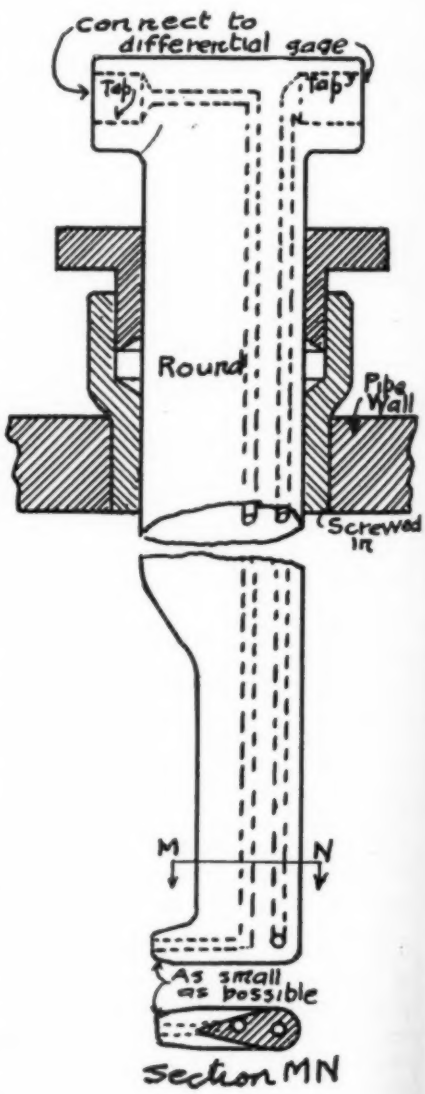


Fig. 48. Pitot Tube for Large Pressure Pipes

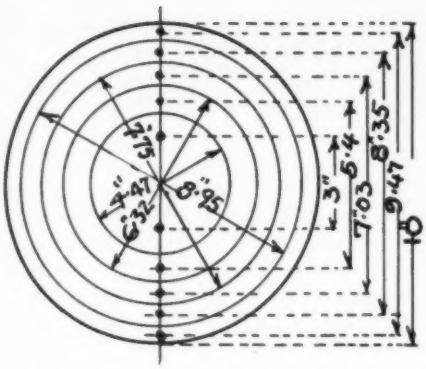


Fig. 49. Diagram of Method for Making a Traverse of Pipe to Obtain Mean Velocity

heads while the space between the tubes is affected only by the pressure in the pipe, this being transmitted through the holes B. Consequently if a differential gage (Article IX) is attached between the points C and D of the Pitot tube this gage will indicate the velocity head directly.

The Pitot tube may be used to measure discharge in a pipe without interfering in any way with its operation, for it is possible to design a tube that can be inserted through a three-quarter inch corporation stop cock. One such design is shown in Fig. 48. The tube should be located as far as possible from elbows and bends and anything else that can disturb the smoothness of the flow; it should be in a long, straight part of the pipe, and since it is known that the velocity varies from point to point across the pipe a *traverse* of it must be made. One common way of making this traverse is to divide the circular cross section of the pipe up into five annular rings of equal area as shown in Fig. 49, the diameters of these rings being, respectively, 44.7, 63.2, 77.5 and 89.5 per cent of the pipe diameter. The tube is then moved across a pipe diameter, a reading of the velocity head being taken at each point marked with a dot and located as shown. From each velocity head the corresponding velocity is either calculated or read from such a diagram as Fig. 12, and where a fair degree of accuracy is desired it is advisable to traverse two diameters at right angles to one another and after the traverses are completed the average of all the velocities is the mean velocity in the cross section. Multiplying this mean velocity by the area of the pipe, in square feet, gives the discharge in cubic feet per second. (Note that it is the velocities and not the velocity heads that are averaged.)

As this process takes a lot of time it is rather more convenient to make the traverses once for all and by their aid locate the point in the section where the velocity is the same as the mean. The Pitot tube may then be set at this point and from its reading the mean velocity at that cross section may be read off the curve of velocity heads. It is possible that the setting of the tube may change with the mean velocity but usually no effort is made to check this point unless there is reason to suspect some variation.

When making the traverse it is always found that the velocity head varies across the pipe, but if the pipe is straight, with no cross currents caused by bends or obstructions, the maximum reading will be found very close to the center of the pipe. Often, however, the maximum reading is displaced from the center, and if this displacement is relatively large, it is usually advisable to move the tube to another cross section if possible, but if this cannot be done, the traverses must be carefully made at several discharges, where practicable, so as to locate the setting of the tube to obtain the mean velocity reading. Where the tube passes through a stuffing box it must be properly secured or it may be blown out of the pipe, and it is scarcely necessary to say that if the tube vibrates to any extent, its readings will not be reliable.

Since velocities, and therefore velocity heads, are usually small, it is quite general practice to use the inverted differential gage as shown in Fig. 33. If the upper part of the gage contains compressed air, the difference in levels *in feet* between the two water columns will actually be the velocity head at that setting and this is a very common way of working, but for very low velocities some such fluid as kerosene is often used above the water so as to get a magnified reading. Sometimes again, the gage with air on top is placed in an inclined position as shown in Fig. 50, where the slope is such as to give a magnification of five, but as the surfaces of the water in the legs of the gage are not horizontal, the gage is not always easy to read.

One trouble in the use of the tube, particularly for low velocity measurements, is caused by the presence of air bubbles in the connecting tubes between the gage and the Pitot tube, and as this has caused a number of false readings, it has had a tendency to discount the value of the instrument. A very little air may easily cause the gage to show a negative velocity head, which is, of course, sure proof of an incorrect application. The connecting tubes must be blown out from time to time and some of the readings should be checked.

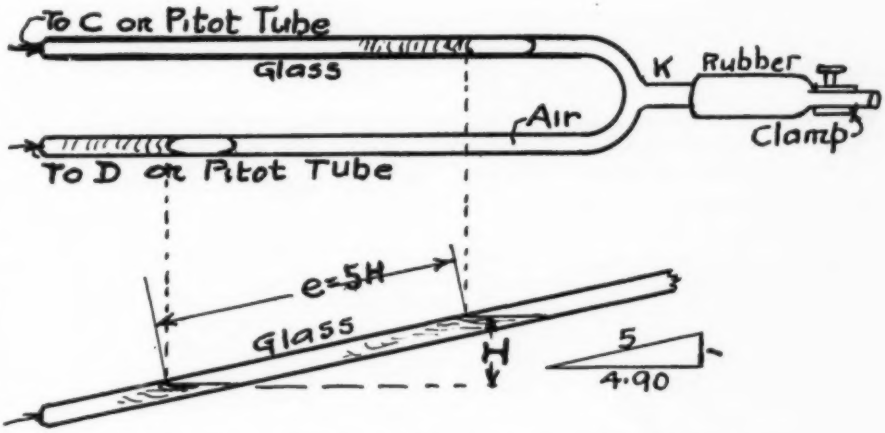
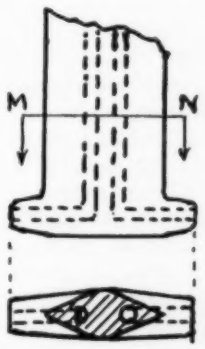


Fig. 50. Sloping Differential Gage with Air Above the Water

A form of Pitot tube used a great deal in analyzing the flow in water works systems is shown in Fig. 51. In this tube both openings are affected by the velocity, the one pointing upstream being subjected to the



(Section MN)

Fig. 51. Form of Pitot Tube Considerably Used in Water Works Systems

sum of the pressure and velocity heads, while the one pointing downstream receives the pressure head less *part* of the velocity head. Tests show that a differential gage attached to this tube indicates less than twice the velocity head, and such a tube must always be calibrated in a stream of known velocity.

To make sure the matter is understood, suppose that an inverted vertical differential gage is used on a tube of the form shown in Figs. 47 and 48, and that the upper part of the gage contains kerosene, which weighs 0.82 times as much, per gallon, as water. If the gage reads 4.13 in., the velocity head will be

$$4.13 \times 0.18 \div 12 = 0.062 \text{ ft.}$$

as explained in Article IX. That is $v^2/64.3 = 0.062$ or $v = 2.0$ ft. per sec.

In closed pipes the author has used both forms of the tube shown in Figs. 47 and 48 and has also used the first form successfully in open channels. In the latter case the gage is easily read by placing it at a convenient height and then sucking on the connection K of the differential gage till both columns appear in it; placing the gage on a slope gives good readings for low velocities. Either form of tube is readily made by a good mechanic, the first form requiring no comment, but the second one being more difficult to make. The lower part must be made from a solid bar, usually brass, and if it is used in a small pipe, the instrument is short and the holes are easily drilled up through it. For the longer instruments the author has joined the short lower end to the manometer connections by brass pipe through which he has run small brass tubes connecting the openings.

EMPLOYER-EMPLOYEE RELATIONSHIPS IN WATER UTILITIES*

By J. W. HEINEY
Manager N. J. Division
WATER UTILITIES SERVICE CO.
PALMYRA, N. J.

WHEN I was requested to discuss the very vital subject of employee-employer relationships, I was somewhat reluctant to do so because it was my feeling that I had not been back in the harness from war service long enough to present a sufficiently comprehensive discussion. On the other hand, I felt that because of my five year absence, from the end of 1940 until the middle of 1946, I might better be able to point out any significant changes in the attitude of our management and our employees to the subject under discussion, or perhaps I would be in a position to point out the lack of change in any of the basic premises of our policy concerning the relationship of our employees to our management.

The Author

Practical Aspects of Problem

This will not be a pedantic discussion about the abstract theories concerning the subject under discussion. It is proposed to confine ourselves to the more practical aspects of the problem. In the New Jersey Division of Water Utilities Service Corporation, we operate and manage fourteen properties engaged in furnishing water service to the public. As a matter of interest, it might be well to point out that the largest of this group of properties has 40 full-time employees, and the smallest of the group has one full-time employee. The other properties, therefore, range in size as far as the number of full-time employees is concerned, between one and 40. It is rather obvious, therefore, that our problem of employee-employer relationship is rather diversified. Let me say, too, that I am familiar in a general way with the operation of our properties in other states, but I wish to confine my observations to those of our properties in the state of New Jersey as their personnel management are the only ones of which I have an intimate knowledge.

A close examination of our thoughts, ideas and policies concerning the relationship of management to workers reveals that our basic concept has not changed over the last several years despite the fact that we have been going through an era of radical change as far as our national understanding of labor relations is concerned.

We believe that we enjoy fairly good labor relations in all of our operations in New Jersey. In our organization, it can almost be considered a condition of employment that a prospective employee must be the kind of a person that we would be glad to associate with even though he were not one of our workers. This concept has prevailed ever since our operation started several years ago, long before labor unions became the object of affection of, and recipients of favors from our major political parties.

Opportunity for Employees

In our operation, it has been the custom to regularly review the performance of our employees and grant pay increases when such increases seem justified. This action on the part of the company results in many of our workers being given increased compensation when it has not been solicited. We constantly seek to give all of our employees an opportunity to qualify for greater responsibility. This contributes to the increased efficiency of our operation. It gives the employee a chance to gain a wealth of experience and, at the same time, it allows the company to benefit the employee with increased compensation. We believe that increased pay for increased efficiency in performing work or for sharing a larger responsibility in our general operation is the only sound wage policy to pursue. We subscribe to it wholeheartedly. The advantages of this policy are obvious

*A paper presented before the 20th meeting of the Penna. Water Works Operators' Assn. and here reproduced by permission of the Assn.

because there is a lack of incentive for organizing. It is appropriate to state that our company does not object to labor organizations, and none of us maintain in our individual attitudes an anti-labor point of view. Despite all of this, we do not like to have our employees organize. When they do, we know that our relationship will immediately change from a very personal one to an impersonal one. This, of course, is always regrettable, but it always does seem to occur. When it does, we lose most of the fun that we now seem to find in water works operation.

We continually strive to recognize an employee as an individual and not as a mere cog in a machine. Such recognition carries with it mutual responsibilities. On the part of the employee, it requires his devotion and loyalty to his job and the company becomes responsible for safe and congenial working conditions, and to see to it that the individual shall have the peace of mind that creates contentment in his personal home life as well as during his working hours.

Employee Benefit

To stimulate this contentment, the following benefits were made available a number of years ago and have been participated in by all of our employees. At the present time all of our employees enjoy the following benefits:

(a) Job security.

(b) Overtime pay.

(c) Vacation with pay.

(d) Regularly observed holidays.

(e) A good insurance plan which gives them and their dependents protection of all kinds for which they pay a rather nominal premium, as the company bears the larger share of the premium cost.

(f) An established retirement plan.

In connection with job security, may I say that we have several employees in our operations who have as much as forty years of service with us. We know that as these employees view their term of service with the company, in retrospect, they appreciate the value of job security. They are still giving the company, despite their age and years of service, efficient, loyal, and faithful stewardship.

Overtime pay, vacations with pay and regularly observed holidays are, of course, now generally recognized and no further comment appears necessary in discussing these benefits.

Insurance & Pension Plans

Our insurance plan is most comprehensive as it covers not only the employee but his dependents. This plan includes the following types of insurance:

(1) Group life insurance.

(2) Accidental death and dismemberment insurance.

(3) Weekly accident and sickness benefits.

(4) Daily hospital expense benefits for employees.

(5) Daily hospital expense reimbursement for dependents.

(6) Reimbursement for "additional charges" for employees and dependents.

(7) Surgical reimbursement for employees and their dependents.

In addition each employee may purchase a regular ordinary life insurance policy in the same amount as his group life policy. While remaining in our employ, the company pays 30 per cent of all this premium.

Our pension plan, although existent for years, has never been reduced to a definite formula that might, in certain cases, result in a hardship, as often happens, when a definitely cut and dried plan is followed. Ours is sufficiently flexible to assure security for our retiring personnel. It does assure each employee, without any contribution on his part, that if he stays with us until old age or until other disability catches up with him, he will have earned at least one per cent of his salary at the time of retirement for each year of service. Length of service, value of the employee to his company, and his general attitude affect this earned amount which varies from a minimum of one per cent to a maximum of one and one-half per cent. Actually, we have not yet found anyone who has not qualified for the maximum benefits.

As an example of how our retirement plan works, let us take an illustration. Let us assume that an individual has been employed by us for 25 years and reaches the age when he desires to retire. Even though this employee may have started working for us as a laborer at a compensation of 40 cents per hour, he may now be a foreman compensated at a rate of $60 per week. According to our plan this man will have earned one and one-half per cent per year toward retirement or a total of 37½ per cent of his most recent pay of $60 per week. This, of course, would amount to $22 per week retirement income.

Try A Bowling League

In order to create and maintain a more desirable "esprit de corps" among our employees, it was conceived in 1946 to set up a "mail order" bowling league made up of teams from the various operating properties. Both the female and male employees were encouraged to join the various bowling teams. The company bears 75 per cent of the cost of operating this league. Results of the various matches and a schedule of individual averages and scores are forthcoming from the general office to all of the various property teams each week, together with a schedule of the next week's matches. You would be surprised how much enthusiasm, good will and general interest this bowling league has developed. Quite naturally, inter-company rivalries develop, and when the rivalry reaches its peak, where it is geographically possible we try to arrange a shoulder to shoulder match. This get-together is usually preceded by a dinner at company expense and gives our employees from different parts of the system an opportunity to get to know each other and learn to call each other by their first names.

Our organization, probably because of individual desires, has become quite well known as a first name organization. Most everybody, with few exceptions, calls everybody else by his first name or by his nickname. This certainly contributes to a better understanding between all of us. When you feel free to call your fellow employee by his first name, you certainly have arrived at an area of mutual understanding and consideration.

Another one of the practices of our company concerns the remembering of all of our employees during the Christmas holiday. Just b e f o r e Christmas, each and every one of our employees receives a large box of citrus fruit shipped directly to him by express from Florida. This Christmas greeting is exactly of the same size and quality for each employee. The president of our organization receives the exact same gift as the man who does labor work for the Ocean City Water Service Company. Everyone participates equally regardless of his position in our operation. We know that this practice is appreciated as evidenced by the many spontaneous communications that reach the general office expressing thanks for this Christmas remembrance.

Summer Vacation at the Seashore

We also maintain for the benefit of all of our personnel a large seashore apartment at Ocean City, N. J., fully equipped and capable of housing nine people in full comfort. The very temperate climate in early spring and late fall in Ocean City and the excellent resort summers make the place highly popular with our people, who, in season, do not allow it to remain idle for a day. Preference in the reservation list is given to those folks who live the greatest distance from the bathing resorts, which means, of course, that our New Jersey employees must take what little time is left after our New England and Pennsylvania employees take their first pick. The many compliments paid are a satisfaction to us and are a justification of the considerable effort and expense to which we are subject in providing this recreational facility.

During the season just passed the apartment was continuously occupied from April 19 to September 27. One week is allotted to any group using the apartment, which indicates that twenty groups will enjoy the benefits of this greatest of all family seashore resorts in the summer.

As an indication of the popularity of this apartment this year, we acted as hosts to one group from Maine, one group from Massachusetts, 11 from Pennsylvania and seven from New Jersey.

Respect Dignity of Employee

We respect the dignity of every one of our employees. We recognize that each of them, regardless of their position, makes a definite contribution to the success of our operation. We further recognize that each of our workers is entitled to certain rights and considerations. We encourage all of them to discuss their personal as well as their working problems with us if they so desire. Our latch string is always out and many of them seek our advice during periods when insurmountable personal problems weigh heavily on their minds. We go to the extreme limit of our ability to help them solve these problems in a material or any other sort of way that seems to be indicated after prudent consideration is given to each particular case.

In conclusion, let me say that we have no so-called "big shots" in our organization riding around in long, sleek, black automobiles. No one works under any other person. We are all associated together, working for the common good of the organization. Naturally, some of us have a little more authority than others, but we all try to make our enthusiasm and interest infectious.

W. R. Seeger, Asst. Ch. Engr. Marin Water Dist.

William R. Seeger, former Project Engineer of the Engineering Office of Clyde C. Kennedy, San Francisco, has recently been appointed Assistant Chief Engineer of the Marin Municipal Water District in San Rafael, Calif.

Hello—Water Works!

Hello—Water Works? We want to make a slight correction in our forecast. The drought is broken, and you can take the ban off of lawn sprinkling.

[Ed. Note: This couldn't happen to our weatherman "H.P.G." See his "Weather in Prospect"—this issue.]

New Home of the Long Island Water Corp, Lynbrook, L. I.

One of the few new water works buildings of 1947 was that of the Long Island Water Corp., in Lynbrook, L. I. In addition to general offices for the operating, commercial and engineering departments, the new building contains a garage and water testing shop.

Dean Saville Appointed to N. Y. State Public Health Council

Announcement has been made of the appointment of Thorndike Saville, dean of the College of Engineering, New York University, as a member of the New York State Public Health Council to fill a vacancy created by the death of Professor Henry N. Ogden.

Dean Saville has a wide experience in the field of water and sewage treatment in relation to public health. In 1919 he traveled England and France as the Sheldon Traveling Fellow to investigate river regulation and sewage treatment plants. In the same year he was appointed Associate Professor of Hydraulic and Sanitary Engineering at the University of North Carolina, which he left in 1932. Since 1932 Dean Saville has been Professor of Hydraulic and Sanitary Engineering at New York University, and since 1935, Associate Dean and Dean of the College of Engineering.

Dean Saville is the author of a number of technical papers and has been active in many technical and scientific societies.

OPERATION OF SMALL FILTRATION PLANTS

IV. Coagulation and Settling

The Fourth of a Series of Articles

By A. E. CLARK
General Manager
NASHVILLE SUBURBAN UTILITY DISTRICT
NASHVILLE, TENN.

IN considering the overall functioning and final results obtained in water filtration plants, proper chemical dosage, pre-mixing and settling of the raw water comprise the most important part of plant operation. The total efficiency of the filters is directly dependent on the condition of the water reaching them. This affects (1) the quality of the water filtered, (2) length of filter runs, and (3) condition of the sand. Obviously, if improperly conditioned water is filtered the first effect noticed might be a slightly turbid or smoky water which might become progressively worse if the settling process continued to deteriorate. Shortening of filter runs will follow and over a relatively short period of time the sand may be affected.

The efficiency of the settling process depends on (1) proper design of pre-mixing facilities, (2) proper design of settling tanks, (3) proper coagulant dosage employing the coagulant best suited for the raw water used. The subject of coagulants and feeders was discussed in the previous article.

Pre-mixing

When the so called rapid sand filtration plants came into use in this country, no provision was made for pre-mixing the raw water and coagulant with consequent floc formation before reaching the settling tanks. This gave rise to considerable difficulty in obtaining good sedimentation under varying conditions of the raw water. In some instances the coagulant was added into the main conveying the raw water to the inlet end of the tanks and while some mixing occurred it was not sufficient to produce dependable settling. Periods of high turbidities and low temperatures very frequently caused difficulties and at times very low turbidities gave the operator a headache. In other words, if reasonably good results were to be expected, the operator had to be on his toes at all times.

The Author

It was found, however, if the raw water and added coagulant were subjected to an arrangement whereby they were intimately mixed and the velocity was considerably higher than in the settling tanks to prevent deposition of the formed floc, the efficiency of the settling tanks was very materially increased. Over and under baffles and around the end baffles were used almost entirely providing a mixing period of 10 to 30 minutes. The design of the baffles had to be such that after formation the floc was not torn apart by too high velocities caused by the baffles. The baffles were usually designed so that the velocity could be changed by changing their arrangement. Experimental work indicated that more flexibility could be obtained by using mechanical mixing devices. These are of many types and designs but all work on the same basic principle of getting the raw water and coagulant mixed and the floc formed before reaching the settling tanks. The mechanical mixing arrangements are electrically operated through a reduction gear train giving more flexibility than by the removal or replacement of baffles.

Where advantageous for the particular raw water to be treated, the so called flash mix has been incorporated in the design of quite a large number of plants. This is a mechanical mixing arrangement whereby the raw water and coagulant are subjected to a short violent mix before entering the mixing chamber.

The coagulant dosage is first determined by using the jar test then checking the pH of the raw water and the settled water. From this point the operation of the mixing device depends on the operator. He may find that it will be necessary to change the baffles in a gravity mixing chamber or the speed of rotation in a mechanical mixing chamber. A mixing period varying from 15 to 30 minutes has been found satisfactory for the majority of waters and it would be safe to state that if the speed of the mixing device is properly adjusted or the baffles properly adjusted for what might be called a normal condition of the raw water, little change has to be made except to vary the coagulant dosage for the changing conditions of the raw water.

If mechanical mixing is employed be sure that all moving parts are properly oiled or greased in accordance with the manufacturer's instructions. Check frequently any shafts which pass through concrete walls and if leakage starts, repack or repair this condition immediately, whichever is indicated. Check the under water metal parts at regular intervals and repaint when necessary. The same applies to any wood paddles used. Drain periodically and clean out any collected debris on the floor of the chamber. If the meter and gear train are located so that water can collect or possibly flood the meter, the installation of a sump pump pays dividends. Change the oil in the gear train case with the type and grade recommended by the manufacturer and at the intervals recommended by them.

Settling Tanks

As stated above the first designs conveyed the raw water directly into the settling tanks through an opening usually at the center of the influent end wall at varying depths depending on the designer. In the

light of present day practice one can readily understand the difficulties encountered in getting efficient settling. The tanks were usually designed with one or more around the end baffles, which did not help conditions and when cleaning time came only added difficulties. It was found that the efficiency of settling could be raised if straight flow through tanks was used and this design became standard practice. One more item served to benefit the settling: the introduction of the pre-treated water into the settling tanks through a relatively large percentage of the vertical area at the influent end. This was accomplished in some cases by using hydraulically designed dispersion walls placed in front of the raw water inlets but later design incorporates this in a channel or channels built integral with the tanks. The take off at the effluent end is over a weir or weirs near the flow line level in the tanks and conducted to the filters with as little disturbance or change of velocity as possible. Where difficulties are expected in settling, some plants are designed for series operation of the settling tanks if desired. This allows a second dosage of coagulant to be added after settling in one or more tanks for further settling.

Cleaning has always posed its problems. When to clean and how best to do it in the quickest possible time. Drains sufficiently large to take care of the settled material are provided and if the settled material has not packed to any great extent cleaning can be accomplished in a relatively short time. Connections for fire hose are provided and sufficient pressure and volume should be available; otherwise cleaning is a real task.

This "headache" has also been solved by the introduction of mechanical devices for the continuous removal of sludge. The arrangement is relatively simple and provides scrapers which carry the settled sludge from the effluent end of the tanks to the influent end where it is removed by decanting, utilizing the head of water in the settling tanks for this purpose. The rate of decanting can be adjusted to suit the varying quantity of settled sludge. These can be operated continuously or at regular or irregular intervals. The time of operation will depend on local conditions.

Coagulant

Aluminum sulfate is probably more generally used as a coagulant than any other. Good results are obtainable using aluminum sulfate with the average water. Sometimes waters contain substances which make the use of some other coagulant necessary as satisfactory results cannot be produced when using aluminum sulfate. Other coagulants used are, ferrous sulfate and lime, ferrous chloride, ferric sulfate, ferric chloride, sodium aluminate, some of the silicates; experimental work has been done using some of the clays.

The best coagulant to use depends on the raw water to be treated. If aluminum sulfate is being used and it is contemplated using another, it is suggested that sufficient experimental work be done before making the change. By utilizing the jar test with the new coagulant, sufficient information can be obtained as to whether or not it should be tried on a plant scale. It might be well to purchase a supply for a known period of time to be sure the desired results are produced.

The jar test is invaluable in determining the dosage of whatever coagulant is used. Use this test as frequently as necessary to produce the best possible settled water. The average well designed pre-mixing chamber and settling tank should give better than 90 per cent removal of turbidity providing the coagulant dosage is correct and the best coagulant for the raw water is used. The coagulant to be used is governed by conditions rather than turbidity removal alone. These factors may include hardness combined with turbidity or hardness alone, iron removal color or industrial wastes.

Each water is a different problem and each problem must be solved locally. No hard and fast rule can be applied to coagulation. The best advice is to keep close watch of this part of the plant operations. See that the coagulant dosage is correct and that it is being fed into the raw water at all times. The quickest check is to make a pH determination of a sample collected from the mixing chamber. Any change in coagulant dosage will be readily detected by this test. In this way the operator is enabled to correct the dosage before any harm is done. If allowed to continue until improperly treated water passes through the settling tanks, filter difficulties may and generally do occur.

Chemical Engineers Discuss Antipollution Regulation

At the fortieth annual meeting of the American Institute of Chemical Engineers held in Detroit in November, one of the papers receiving the greatest attention was the report of a survey sponsored by the Committee on Industrial Waste Disposal. This paper was presented by Anthony Anable, Director of Public Relations of The Dorr Co., and covered current antipollution legislation and practices of the various state authorities with respect to liquid industrial wastes.

Mr. Anable reported that the doctrine of "reasonable use" of the streams for waste disposal is becoming increasingly popular and better cooperation between industry and state is being achieved.

One of the suggestions made was to the effect that industry considers waste disposal as an inseparable part of the evaluation of a new process. Mr. Anable favors the formation of sanitary districts in which all industries present would cooperate in an over-all waste disposal problem, and he reported that a federal antipollution law is probably certain of enactment in 1948.

"Field Practice"

Part III Data Book For Civil Engineers

The third and final part of Seelye's Data Book for Civil Engineers has been published. Part I was concerned with "Design," and was published in 1945; Part II "Specifications and Costs," was published in 1946.

"Field Practice" is a part of the series but is, like the others, a self-contained entity. It has been designed primarily for the field engineer or inspector for inspection of practically any line of civil engineering work.

The book includes outlines of inspection procedure, check-lists on concrete, masonry, structural steel, welding, bridges, foundations, pile-driving, etc., etc.

The aim of this book, according to the author, is to furnish the field engineer or inspector with sufficient data so that, if he had to, he could function with no other aids. The book is pocket-size, contains 306 pages, is published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., and retails for $4.50 a copy.

FALL MEETING OF NEW JERSEY SECTION AT ATLANTIC CITY

South Jersey Water Superintendents Join in Convention

OUTSIDE a sixty mile gale played an obligato on the banging windows, rain lashed at the hapless pedestrian on the famous Atlantic City Boardwalk, while the gray and angry Atlantic Ocean rolled and tumbled over the sandy beach. Inside the Claridge Hotel, shouting to be heard above the din, some sixty members and guests participated in the annual Superintendents' Breakfast and Round Table of the New Jersey Section of A.W.W.A.

Officers

Chairman	Secy.-Treas.
Ros. M. Roper	*C. B. Tygert*
Gen. Mgr.	*Dist. Mgr.*
Water Comm.	*W. & T.*
East Orange	*Newark*

(Unfortunately the photographer did not get a snapshot of E. D. Sheehan, the incoming chairman)

This was the concluding session of the highly successful meeting which drew more than 280 persons, of whom nearly ninety per cent attended the annual banquet. It was at that banquet that A.W.W.A. Secy. **Harry Jordan** remarked that the growth of A.W.W.A. was attributable to good fellowship, interest of members in others' problems, and the desire to advance the profession, all of which had been evidenced in great measure in the New Jersey Section.

Business Session

Officers elected for the ensuing year were as follows:

Chairman: E. D. Sheehan, Supt. of Water, Camden, N. J.

Vice Chairman: P. S. Wilson, Repr., Rusta Restor Co., Glen Ridge, N. J.

Trustee: R. E. Bonyun, Supt., Passaic Valley Water Comm., Paterson, N. J.

Trustee: Alonzo Shinn, Supt., Bd. Water Comm., Burlington, N. J.

Secy.-Treas.: C. B. Tygert, Dist. Mgr., Wallace & Tiernan, Newark, N. J.

Charles H. Capen, Ch. Engr., No. Jersey Water Supply Comm., Wanaque, N. J., continues as A.W.W.A. Director, and Roswell P. Roper, Engr. and Gen. Mgr., Bd. Water Comm., East Orange, N. J., remains on the board of trustees as past chairman.

It was reported at the business session that the State of New Jersey had passed a law giving the Water Policy Commission control of all ground waters in the state (including industrial supplies). This act was the direct result of action taken at last year's N. J. Section meeting requesting such a law.

Fuller Award

Under the chairmanship of Samuel F. Newkirk, of Elizabeth, N. J., the Fuller Award Committee designated this year's awardee with the following citation: "In recognition of his skillful guidance of water supply agencies in New Jersey to the end that the citizens and industries in the state shall not lack an ample supply of water, **Howard Thompson Critchlow** is chosen as the recipient of the George Warren Fuller Award for the year 1948."

Fuller Award

Howard T. Critchlow
Chief Engr., State Dept. Conservation
Trenton, N. J.

Pipe and Pipe Lining

The technical program opened with a movie by the Lock-joint Pipe Co., showing "The Manufacture of Reinforced Concrete Pre-Stressed Pipe at Wharton, N. J."

In addition to presenting **"The Pittsburgh-Eric Process of Pipe Lining,"** Alfred B. Anderson, Ch. Engr., Water and Sewer Div., Pittsburgh Pipe Cleaner Co., Pittsburgh, Pa., also mentioned a simple method of testing small lines for capacity and flow coefficient.

The Eric Process, developed in England, deposits a lining of bitumen on the inside of pipes. The pipe must be cleaned first, then filled with an emulsion of Lectumen from which, by means of a traveling cathode, the bitumen is deposited on the pipe, which is the anode. Up to 1,000 feet of pipe can be coated from one setting of the equipment. When the current stops flowing as shown by instruments, that section of the pipe is coated and the cathode is moved on. After the pipe is coated, the Lectumen is pumped out, the pipe flushed and put back in service. No difficulties are encountered with the bitumen entering or plugging stop cocks or services. The coating has a leathery feel; it is not brittle like bituminous enamel and it imparts no taste or odor to the water. Pipes from 3 to 24 in. can be coated by the process. Above the latter size, the process is too expensive.

Report of Comm. of Water Supply

The Report of the Committee on Water Supply was presented by **Howard T. Critchlow,** Chairman of the Committee. Mr. Critchlow said there were two things of importance occurring during the past year. The first of these was the enactment of a law concerning the diversion of subsurface and percolating water of the State for domestic, industrial, and other uses. This act gives the Division of Water

Trustees

P. S. Wilson	P. E. Bonyun
Rusta Restor Co.	*Gen. Supt.*
Glen Ridge	*Passaic Val. Water Comm., Paterson*

(Wilson moved up to Vice-Chairman and Alonzo Shinn became new Trustee)

Policy and Supply of the Dept. of Conservation "authority to delineate . . . such areas of the State where diversion of subsurface or percolating waters exceeds or threatens to exceed the natural replenishment or will render them unfit for use by the intrusion of salt water, etc." The act was set up to conserve natural resources and another to license well drillers.

The second piece of legislation of interest was an act to provide for the rehabilitation of the Delaware and Raritan Canal for permanent utilization of the property and water rights as a supply for industrial water and recreational use. To date more than $600,000 has been expended in the rehabilitation of the old structures of the Canal in accordance with a plan to deliver up to 75 mgd. At least $443,800 more is needed in the next two years to complete the rehabilitation. Contracts have been drawn for the sale of the water and the project will be self liquidating.

Host
Max Grossman
Asst. Supt. & Engr.
Water Dept.
Atlantic City

AWWA Director
Chas. H. Capen
Chief. Engr.
N. J. Water Comm.
Wanaque

The water situation in New Jersey is not critical now, as a result of a more than normal rainfall during the past year. There has been a steady increase in water consumption, however, and a drouth as extensive as those in 1939 and 1941 would indeed be serious.

Electrification

Assistant Chief Engineer A. C. Hutson of the National Board of Fire Underwriters spoke on **"The Electrification of Water Works Pumping Stations and Filter Plants."** Mr. Hutson called attention to the fact that until about 25 years ago all water plants were operated by steam. Since then electrification has been proceeding at increasing rates. Mr. Hutson pointed out that every piece of equipment should have a standby and that includes the source of electrical power.

It is not only the large pumps that need standby power, but in the modern filtration plant there are many motors that are important to the proper operation of water plants. Mr. Hutson cited several occurrences of power failure which had caused difficulties in water plants and where flooding had thrown the water supply out of service.

Not only is it a matter of fire protection, which clear well storage alone cannot solve in the case of power failure, but there exists a public health problem as well. The Fire Underwriters are not willing to go on record as okehing electrification without adequate power standby service. It is not simply a matter of economics. Adequacy and reliability are of first importance.

W. W. Brush, Editor of *Water Works Engineering,* New York City, and Treasurer of the A.W.W.A., suggested that perhaps the A.W.W.A. should set up minimum requirements of standby equipment. Harry Jordan, Secy. of A.W.W.A., said that was a good idea but hard to do. It is true we need a minimum reliability for various parts of a water plant, but there is the matter of legality in the various states and communities. All of these factors must be evaluated in any attempt to set up such requirements.

Fluorides in Water Supply

As to the **"Presence of Fluorine in Water Supplies in N. J.,"** Dr. John E. Bacon, Chief, Bureau of Chemistry, State of New Jersey, said that except for a small area and a few supplies, the concentration of fluorine is less than the maximum limit allowable if mottled teeth are to be prevented. In fact, 90 per cent of the supplies have less than 0.25 ppm. of fluoride and only 3 per cent have concentrations of fluoride above 1.0 ppm., while 99 per cent are below 1.5 ppm.

"Fluorine in Water Supplies as a Measure of Dental Health" was the topic of discussion presented by Dr. J. M. Wisan. Observation over the past 45 years has shown that there is a relation between excess fluorine in water and mottled teeth, while at the same time lack of a minimal concentration of fluorine in water is a contributing factor in the incidence of dental caries. Studies of school children in New Jersey have indicated an increase in dental caries in the past fifteen years. Dr. Wisan referred to the experiments at Newburgh, N. Y., and elsewhere and proposed that New Jersey set up controlled experiments, but that widespread adoption of the treatment of water with fluorides be delayed until these experiments are conclusive. Present information indicates that the cost is approximately 9 cents per person per year for fluoride treatment, and that no ill effects are observed, while beneficial results are possible.

George Norcom, Cons. Engr.-Chem., called attention to the problems inherent in mass medication via the water supply and emphasized the need for continued study before widespread adoption of fluorination became the order of the day. Mr. Norcom suggested that perhaps the addition of fluorides to food or milk would prove far better than the wasteful application of fluorides to water supplies.

Harry Jordan, Exec. Secy. of the A.W.W.A., said that any experiment on fluorination in a public water supply must have the backing of the state health department, the local health department, and the U. S. P. H. S. It must be the result of a city ordinance establishing the experiment, and it should be paid for by the State Health Dept. If these rules are followed, there can be no legal action taken against the water department.

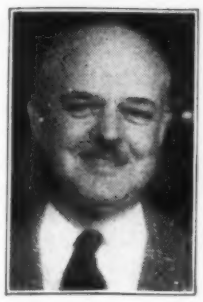
So. Jersey Water Supts.

Secretary
Walter E. Spencer
Supt. Water
Merchantville

Treasurer
J. H. Simmerman
Supt. Wtr. & Sew.
Pitman, N. J.

Operating Sheets for Distribution Systems

An outstanding presentation of a paper was that by Laurie M. Leedom, Construction Engineer, Division of Water, Newark, N. J. Mr. Leedom spoke on **"A Streamlined Procedure for Shutting Down Large Water Mains in Case of a Break."** "Don't depend on one man's memory," said Mr. Leedom, who emphasized the necessity for making out a schedule ahead of time for shutting off each section in the city. By means of a map of the location of all main valves in a certain area



A. E. Anderson
Chief Engr.
Water & Sew. Div.
Pittsburgh Pipe Cleaning Co.

A. C. Hutson
Asst. Chf. Engr.
National Bd. of Fire Underwriters
New York

John E. Bacon
Chief
Bur. Chemistry
N. J. Hlth. Dept.
Trenton

Dr. J. M. Wisan
Chief
Div. Dental Hyg.
N. J. Hlth. Dept.
Trenton

Laurie M. Leedom
Const. Engr.
Div. of Water
Newark

Edward Walasyk
Asst. Engr.
Hackensack Water Co.
Weehawken

Programmers All!

and with the setting up of a schedule for shutting off valves in that area, it is possible to make sure that an area is shut off in case of a break or other reason. Large valves are shut off first, then the smaller ones.

Mr. Leedom has his map in a plastic envelope with an operating sheet which tells exactly the sequence of steps to be followed. As a check on this system of operating sheets, a check should be made of the various areas to make sure that the instruction sheets and map are correct to the smallest detail.

For operating large valves of 20 to 48 inches, Mr. Leedom uses two Payne Dean Valve Operators and plans to use cone valves on the 48-in. lines, as these valves can be closed by one man in a few minutes.

Valve vaults are fitted with lights which are powered by a Homelight Portable generator. By this means it is possible to have adequate lighting, but the difficulties inherent with hooking such a system into the main power lines are absent.

An emergency kit is maintained at the office, with a complete set of maps, flashlights, first aid materials, and anything else that may be needed in the case of an emergency shut-off. All trucks are equipped with a set of these maps and operating sheets, and supervisors carry them, too.

Meter Service and Sizing

On the subject of **"Meter Service and Sizing,"** Edward Walasyk, Asst. Engr., Hackensack Water Co., Weehawken, N. J., said that from a study of 39 buildings in the territory of the company they had been able to arrive at some preliminary conclusions.

Meter masters were used in the study, and as might be expected, the maximum flow occurred at 7 to 8 a. m. The results of these studies are shown in the accompanying table. The computed flow was determined by the U. S. Bureau of Standards method of computing most probable maximum rate of flow in plumbing systems. In making these computations the following basis of number of fixture units was used:

For buildings having flush valve water closets:

Bathroom group..	8 fixture units
Laundry trays....	3 fixture units
Kitchen sink	2 fixture units
	13 fixture units per apartment

For buildings having flush tank water closets:

Bathroom group..	6 fixture units
Laundry trays....	3 fixture units
Kitchen sink	2 fixture units
	11 fixture units per apartment

RELATION BETWEEN ACTUAL AND COMPUTED MAXIMUM RATES OF FLOW AND THE NUMBER OF APARTMENTS IN BUILDING IN HACKENSACK WATER COMPANY TERRITORY

No. of Apts. in Bldg.	Buildings Having Flush Tank Toilets — Rate of Flow Gpm. Actual Flow	Computed Flow	Ratio Actual to Computed	Buildings Having Flush Valve Toilets — Rate of Flow Gpm. Actual Flow	Computed Flow	Ratio Actual to Computed
10	18	46	39%	60	75	80%
20	25	69	36	68	100	68
30	31	90	34	76	125	61
40	37	111	33	84	145	58
50	42	135	31	92	163	56
60	46	153	30	102	181	56
70	49	173	28	111	197	56
80				119	213	56
90				126	230	55
100				132	245	54
110				136	260	52
120				140	275	51

From these data it appears that in planning for water service needed for apartment buildings, it would be safe to take one-half the computed value in the case of apartments with flush tank toilets, and that the computed value would be ample for apartments with flush valve toilets. In both cases then the actual flow would be between 50 and 70 per cent of the estimated demand.

Mr. Walasyk said that it was planned that there be at least 15 lb. pressure at the top floor. It is hoped that from these studies it will be possible to work out a guide to the selection of the size of the pipe and meters, allowing for a factor of safety, in order that architects and builders will be able to give better cooperation to the water depart-

E. Arthur Bell
Boro Engr.
Essex Fells

Martin E. Flentje
San. Engr.
Am. W. W. & E. Co.
N. Y. C.

Chas. A. Bourgin
Supt. Water
Montclair

Verne Smith
Supt. Pub. Wks.
Park Ridge

More Programmers

ment in the matter of proper water piping in apartments.

In the discussion which followed Mr. Walasyk's paper, the matter of proper meter sizing was stressed. Consensus was that the service line should be larger than actually needed and that the meter should be of the right size. Meters should not be overloaded. Neither should they be underloaded.

Legal Liability

Under the leadership of **Ralph E. Bentley,** Secy.-Treas., Passaic Valley Water Comm., Paterson, N. J., a panel discussion was held on the topic, **"Liability for Damage Resulting from Water Operations and Appurtenances."**

The first speaker on the panel, **Harold M. Ohland**, Hydraulic Engineer, Water Dept., Jersey City, N. J., spoke on "Breaks Causing Floods." Mr. Ohland said that municipalities are not free from liability suits and in the case of flooding due to breaks, it is necessary that good, accurate, and complete records be kept of the incident. "Complete records" means records of information on time of break, time of notification of men, time of arrival of workmen, time shutoffs were completed and any other detailed information that would serve to indicate that the department had not been negligent in performing its duties. Several cases were cited.

"Leaks Causing Undermining, etc.," was the topic presented by **Charles G. Bourgin,** Supt., Bureau of Water Supply, Montclair, N. J. Mr. Bourgin said that the cause of leaks was important. If, as has happened, the cause was outside the responsibility of the water department, then there was no liability on the part of the department. In any case, insurance is needed, as it is cheaper to carry insurance than to pay claims. Mr. Bourgin cited several cases of undermining due to leakage, pointing out the different underlying cause in each case.

"Curb Boxes Causing Injuries" are becoming more and more a factor in insurance claim payments, according to **Ralph L. Tyler,** Water Utilities Service Corp., Camden, N. J. Mr. Tyler believes that there should be an inspection program for curb boxes, although it need not be a regular one. They should be maintained in good condition. They should not extend above the surface of the ground.

Using a humorous approach to the subject, Mr. Tyler compared the old days with the present and pointed out that insurance companies today are prone to settle claims without contest because the company would have to prove contributory negligence on the part of the complainant, and this is not easy to do when there are no witnesses.

"Cross Connections Causing Illness" was the subject of the paper written by Harry Croft, Chief Engineer, N. J. State Dept. of Health, and presented by **Robert Shaw,** Sanitary Engineer in the department. Mr. Shaw defined cross connections as any physical connection which permits or may permit the flow of water from an unapproved source to an approved water supply.

Mr. Shaw cited three instances where cross connections were involved in epidemics. One in 1922 resulted in 114 cases of typhoid and 18 deaths. A second in 1923 resulted in 41 cases of typhoid and four deaths. Circumstances in both cases were similar. There was a drop of pressure and leaking valves. The third was in a shipyard in 1942 where there were 448 cases of dysentery, no typhoid and no deaths. It was necessary to close the shipyard until the difficulty could be remedied.

Banquet Luminaries

M. C.
W. J. Orchard
Gen. Mgr.
W. & T.
Newark, N. J.

Speaker
Harry E. Jordan
Exec. Secy.
A.W.W.A.
New York City

There is now a law in New Jersey which prohibits cross connections. No new ones can be made and old ones can exist only by permit.

In summarizing the topic of legal liability, **Benjamin J. Spitz,** Counsel and Gn. Attorney, Passaic Valley Water Comm., Paterson, N. J., said that a municipality had two functions—one is governing and the other is operating proprietary business (water departments). Any actions of the first function are not subject to liability, but a municipality is liable under the second function where negligence is the cause of the damage. Ordinary wear and tear, providing the water department provides normal maintenance, is not considered as contributory negligence.

Generally speaking, unless the original installation was faulty or repair was not made after a fault was reported, the municipality is not liable. Mr. Spitz said that a water company or department is not an insurer and has no liability except where negligence is shown. This does not include discontinuance of service or leaking cross connections as a basis for legal liability.

In the discussion period which followed it was brought out that municipalities are not liable for hidden defects in equipment, and it was re-emphasized that the keeping of full records in the case of breakdown is essential.

Superintendents' Round Table

Under the leadership of **E. Arthur Bell,** Borough Engr., Essex Fells, N. J., the annual breakfast and round table considered four topics.

Radio in the Small Plant. **J. Arthur Carr,** Engr. Supt., Water Dept., Ridgewood, N. J., uses a two-way radio and finds it a fine thing for emergency and maintenance. It saves both time and money. The Ridgewood system operates through the police department thus saving the need for a licensed operator.

Arthur Bell has an F-M system and said the radius of operation depends on the location of the transmitter and the receiving unit but ten miles is to be expected. **George F. Wieghardt,** Chief Engineer, Hackensack Water Co., Weehawken, said that it is important for water works to get their applications in now for an assignment of wavelengths. **A. C. Hutson,** Asst. Ch. Engr., National Board of Fire Underwriters, suggested that inasmuch as fire departments are now planning to install two-way radio, it would be better for the water department to tie in with the fire department than with the police department as there would be less traffic.

Al Frank, Executive Vice President, National Water Main Cleaning Co., advised that radio can be used for any purpose now and there will be increased demand for allocation of wave lengths. He also suggested that the radio is better than telephones in service trucks as the latter are subject to the usual delays of the telephone system. It is wise to tie in with the police system and thereby obtain technical supervisor service. Applications for fre-

quencies should be made now as they are slow to be issued.

Unusual Uses for Chlorine. As might be expected, it was **Attmore E. Griffin,** Director, Technical Service Division, Wallace and Tiernan, Newark, N. J., who described some unusual uses for chlorine. Probably the most unusual was the application of chlorine to remove sand from water. Sounds silly, but the sand, as very fine grains, was carried in the water by particles of slime in which the sand had become entrapped before the slime broke off. Application of chlorine eliminated the slime and the sand.

Other unusual uses of chlorine include the application to restore pipe line capacity. In one instance where slime growths were so bad that the water actually had to be pumped down hill, the application of chlorine so reduced the slimes that the pipe line capacity was restored. Prevention of tuberculation by an-aerobic action of organisms in slimes is another use for chlorine.

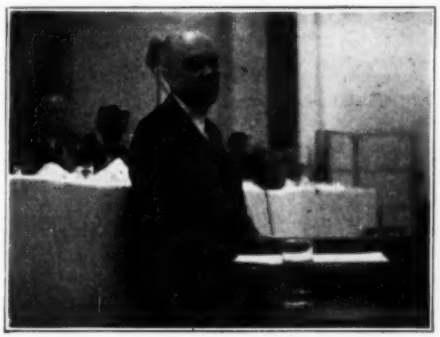
Other unusual uses include the application of chlorine to remove manganese by causing it to precipitate on the filter sand, to stop algae growth, to prevent growth of mussels in power intakes, and to remove ammonia in boiler feed waters. **P. S. Wilson** of Glen Ridge told of the use of chlorine to kill slime in a beer bottle pasteurizer.

Jointing Compounds. The discussion of jointing compounds was confined to sulfur type compounds, and was introduced by **Martin E. Flentje,** San. Engr. American Water Works Co. Mr. Flentje said that in some cases in their study of lead substitutes they had found pitting and graphitic corrosion at the joints. This had not occurred in all cases and the study is continuing.

Jack Diven, of the Leadite Corp., pointed out that the joints in the Atlantic City distribution system had been sulfur type for many many years and that no difficulty had been experienced. Cause of crumbling may be improper heating according to Mr. Diven who thought that perhaps the fact that sulfur is an insulator might be a contributing cause to electrolytic corrosion at joints.

Entertainment

The man behind the mask is not Jerry Colonna and the tall girl is not Charlotte Greenwood. (Both were clever imitators of many persons.)



Fuller Awardee

Howard T. Critchlow making his extemporaneous speech of acceptance.

Guy Northrop, of Northrop Co., said their data indicated a good record for sulfur type joint compounds, and an experimental installation at their yards shows better results than lead where vibration and deflection occur.

George Wieghardt, of the Hackensack Water Co., said that in their system where sulfur jointing compound is used except in sleeves, an 85 per cent accounted-for water attested to the success of these joints.

Arthur T. Luce, New York Water Service Corp., suggested that sulfur joints should not be used on suction lines or on tapping sleeves, and he also pointed out that certain types of bacteria in certain types of soil conditions will attack the sulfur.

Meter Ownership. **James E. Garratt,** Des. Engr., Div. of Water, Newark, N. J., reported that the consumer owned the meters in Newark but he wished the utility owned them. Most persons attending the session were in accord with the opinion expressed by **Arthur T. Luce,** who said, "Why should anyone want some one else to own his cash register."

The four sessions of the meeting were presided over by E. D. Sheehan, Camden; P. S. Wilson, Glen Ridge; R. E. Bonyun, Paterson; and Roswell M. Roper, East Orange.

Kenosha's "Water Supply Protection Works"—Not Waukegan's

To Arthur P. Kuranz of Waukesha, Wis., our apologies for having misquoted him; to Harold T. Rudgal, Supt. of Water at Kenosha, Wis., our appreciation for having called the following error to our attention.

In our October, 1947, issue, on page 359 and 360 appears a digest of the paper presented by Mr. Kuranz before the Am. Water Works Ass'n., in San Francisco. In this digest reference was made to the legality of spending water works funds to provide sewage treatment in Wisconsin in any instance wherein such sewage treatment provides a factor of safety in connection with the local water supply. As an instance, the construction of a sewage treatment plant at Waukegan from water department funds was cited and the treatment plant was officially recognized as a "Water Supply Protection Works" financeable from water supply funds.

Mr. Rudgal has called to our attention that it was Kenosha that constructed the "Water Supply Protection Works" from Water Department funds and not Waukegan. And we hasten to point out that Mr. Kuranz did not make the mistake of crediting Waukegan with the plant.

No Pipeline Corrosion

According to the *Official Bulletin* of the North Dakota Water and Sewage Works Conference, Bowman, N. D., is blessed with favorable soil conditions as well as non-aggressive water.

Water Works Superintendent George Larson said that some salvaged 8-in. cast iron water main laid in 1917 or before had all the appearance of new material both inside and out. There is many a city in the United States that could wish the same condition existed in their locality.

The Two Parallel Plants of Madison, Wis.
(*Trickling Filters vs. Activated Sludge*)

SEWAGE TREATMENT AT MADISON, WISCONSIN*

By CARLTON H. BECKER and M. D. R. RIDDELL
Greeley and Hansen, Engrs.
CHICAGO, ILL.

THE City of Madison and several smaller communities border on Lakes Mendota and Monona, the two major lakes in the upper reaches of the Yahara River. (Fig. 1.) About two miles downstream from Lake Monona is Lake Waubesa, with Lake Kegonsa approximately three miles farther down the river. These waters are extensively used for recreational purposes and, therefore, it is essential that all wastes entering them be treated to produce a highly clarified and stable effluent.

History of Sewage Treatment at Madison

Early in its existence, the city realized the necessity of sewage treatment, and in 1899 a patented chemical precipitation process with sand filters was tried but soon abandoned. In 1901, a septic tank and cinder filter plant was built and continued to serve until 1914, at which time the load had increased far beyond the plant's capacity. The next step was the construction of the Burke plant, a separate settling and digestion plant with trickling filters, which was placed in operation in 1914. (Fig. 1.)

The Burke plant was located in the northeast section of the city and its effluent discharged into the Yahara River and thence into Lake Monona. In the early 1920's the necessity for additional treatment capacity and the advisability of effluent discharge below Lake Monona became apparent. Consequently, studies were made and plans prepared for a plant at the Nine Springs site south of the city. This plant, of the Imhoff tank-trickling filter type with a designed capacity of 5.0 mgd., was placed in operation in 1928.

In the meantime, pollution of Lakes Mendota and Monona from rapidly growing communities outside the city was becoming critical. In order to overcome this situation and to facilitate collection and treatment of all sewage tributary from the entire area, the Madison Metropolitan Sewerage District was created in February, 1930.

In June, 1933, the City of Madison transferred to the District its sewage treatment and principal collection facilities, including the Burke and Nine Springs Sewage Treatment Plants, four pumping stations, force mains and intercepting sewers.

Shortly after the transfer of the City facilities to the District, studies were made and plans completed by Greeley and Hansen for an activated sludge and separate sludge digestion plant addition at the Nine Springs site to operate in parallel with the existing plant. The design capacity of this addition was 6.25 mgd., making the total capacity of the Nine Springs Sewage Treatment Works 11.25 mgd. These additions were completed in May, 1936.

In the meantime, changes were made in two pumping stations (No. 1 and 2) and the force main. This change permitted discharge of all sewage formerly tributary to the Burke plant (including treated wastes from the Oscar Mayer & Co. packing plant) to the Nine Springs site. Operation of the Burke plant was discontinued in December, 1936.

In 1939, plans were completed for a second addition to the Nine Springs Sewage Treatment Works to increase its total capacity to 15.0 mgd. These additions included preliminary settling tanks to serve both the trickling filter and activated sludge plants, aeration tanks to provide a 50 per cent increase in capacity, a final settling tank following aeration to provide a 75 per cent increase in capacity, a 6,750 cfm. gas engine driven blower to provide 85 per cent more capacity, a sludge thickening tank, a sludge digestion tank to provide 50 per cent more capacity, gas scrubbers, additional sludge bed and lagoon area, and other miscellaneous work. These additions were placed in operation in December, 1939, and completed the sewage treatment facilities of the District as they now exist.

*A paper presented before the Central States Sewage Works Assn. and here published by permission of the Federation of Sew. Wks. Assns.

Growth of Domestic and Industrial Load

The area served by the District contains several industries, most of which do not contribute unusually high waste loads. The principal exception is the Oscar Mayer & Co. packing plant, which, at present, contributes about 17 per cent of the total flow and total B.O.D. load on the average, with monthly averages ranging from 15 per cent to 21 per cent of the total flow and from 10 per cent to 24 per cent of the total B.O.D. load.

The growth of the District has been rapid (Fig. 2), having increased in population from about 75,000 in 1930 to about 100,000 in 1943, or 33 per cent. The increase in sewage flow in the same period has been from approximately 8 to 13 mgd., or 62 per cent.

The output of the Oscar Mayer & Co. plant has also increased, as shown in Fig. 3. The kill was 571,655 animals in 1937, while in 1946 it was 1,527,075, an increase of 167 per cent (assuming the same average weight per animal). The increase in flow in the same period was from 1.0 to 2.24 mgd., or 124 per cent, while the increase in B.O.D. of the treated effluent was from 2,180 to 4,080 pounds per day, or 87 per cent. The values for the war years were higher than for 1946, but can be disregarded when considering normal growth. These values all represent yearly averages on a 5-day operating week basis.

The rapid and consistent growth of the District, plus the fact that the existing collection and treatment facilities had about reached their present capacities, indicate the need for long term study and planning. Consequently, in 1944 a comprehensive study of the collection and treatment requirements up to the year 1990 was made by the authors' firm. That study indicated the desirability of treatment of all sewage at the Nine Springs site and the division of the collecting system into two parts.

The sewage from that part of the District in the City of Madison southwest of the Capitol and all of the area to the west will continue to be collected and pumped through existing Pumping Sta. No. 2 and No. 4 to the Nine Springs site. This system is designated as the West Side System. The sewage from that part of the District in the City of Madison northeast of the Capitol and the territory east of Lakes Mendota and Monona will be collected in a new system, utilizing Pumping Sta. No. 1 and other existing facilities, and be pumped to the Nine Springs site. This system is designated as the East Side System and will receive the wastes from the Oscar Mayer & Co. packing plant. Plans for this new collecting system are under way and construction is expected to start within the next year.

Studies of the future growth of the District (Fig. 2) indicate that the population will reach about 140,000 in 1965 and about 185,000 in 1990, while the sewage flows are estimated to be 20.1 mgd. and 27.1 mgd., respectively, for those years. Suspended solids in the raw sewage are estimated at 237 ppm. and are not expected to change materially. The B.O.D. of the composite domestic and industrial sewage is expected to be about 230 ppm., with some possibility of decrease due to additional treatment of the packing plant

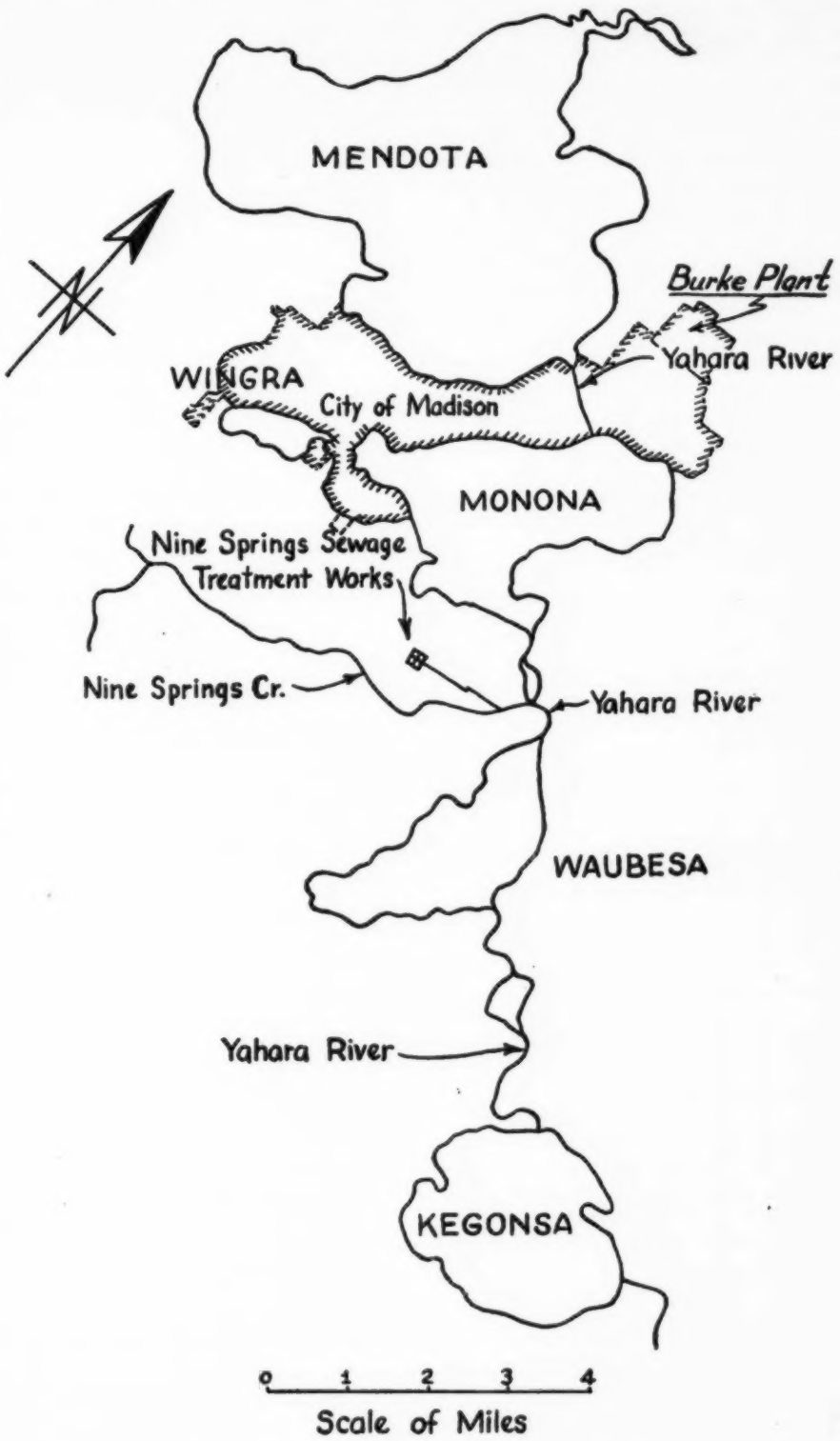


Fig. 1. Madison's Lakes and the Yahara River

wastes and also the economical limiting capacity of the packing plant being reached before 1990.

Basis of Future Plans

As stated previously, the Nine Springs Sewage Treatment Works comprises two plants, a trickling filter plant with a design capacity of 5 mgd. and an activated sludge plant with a capacity for about 10 mgd., operating in parallel. Some consideration was given to the conversion of the existing filter plant to high rate filters. Studies of the hydraulics of the existing plant, however, indicated that this would require expensive modifications. The effluent from the filter plant has not been as satisfactory as that from the aeration tanks (see Fig. 4), and it has been subject to wider fluctuations. These factors, together with space restrictions of the site, construction costs, and the like, indicated the advisability of making future treatment additions of the activated sludge type.

Table I
SUMMARY OF BASES OF DESIGN

Grit Chamber—Controlled velocity	1.0	ft. per sec.
Flocculation Tanks—Displacement period, average flow	25	min.
Preliminary Settling Tanks—Displacement period, average flow	1.5	hr.
Aeration Tanks		
Loading—Average flow	22.0	lb. B.O.D./1000 cu. ft. per day
Air Rate—Average flow	1.0	cu. ft. per gal.
Final Settling Tanks		
Settling Rate—Average flow	800	gal. per sq. ft. per day
Overflow Rate—Average flow	12,000	gal. per ft. of weir per day
Return Sludge Pumps—Return sludge rate, average flow	100%	
Sludge Thickeners—Displacement period	6	hr.
Sludge Digestion Tanks—Loading	2.5	lb. dry solids/cu. ft./mo.
Sludge Characteristics		
Raw		
Moisture content	98%	
Volatile content	76%	
Digested		
Moisture content	96%	
Volatile content	60%	
Elutriation		
Displacement Period Each of Two Passes		
Operation 12 hr. per day, 5 days/week	2.5	hr.
Ratio wash water to sludge	3:1	
Vacuum Filters—Filter Rate		
Operation 12 hr. per day, 5 days/week	2.5	lb. dry solids/sq. ft./hr.
Sludge Drying Beds—Loading	13.0	lb. dry solids/sq. ft./yr.

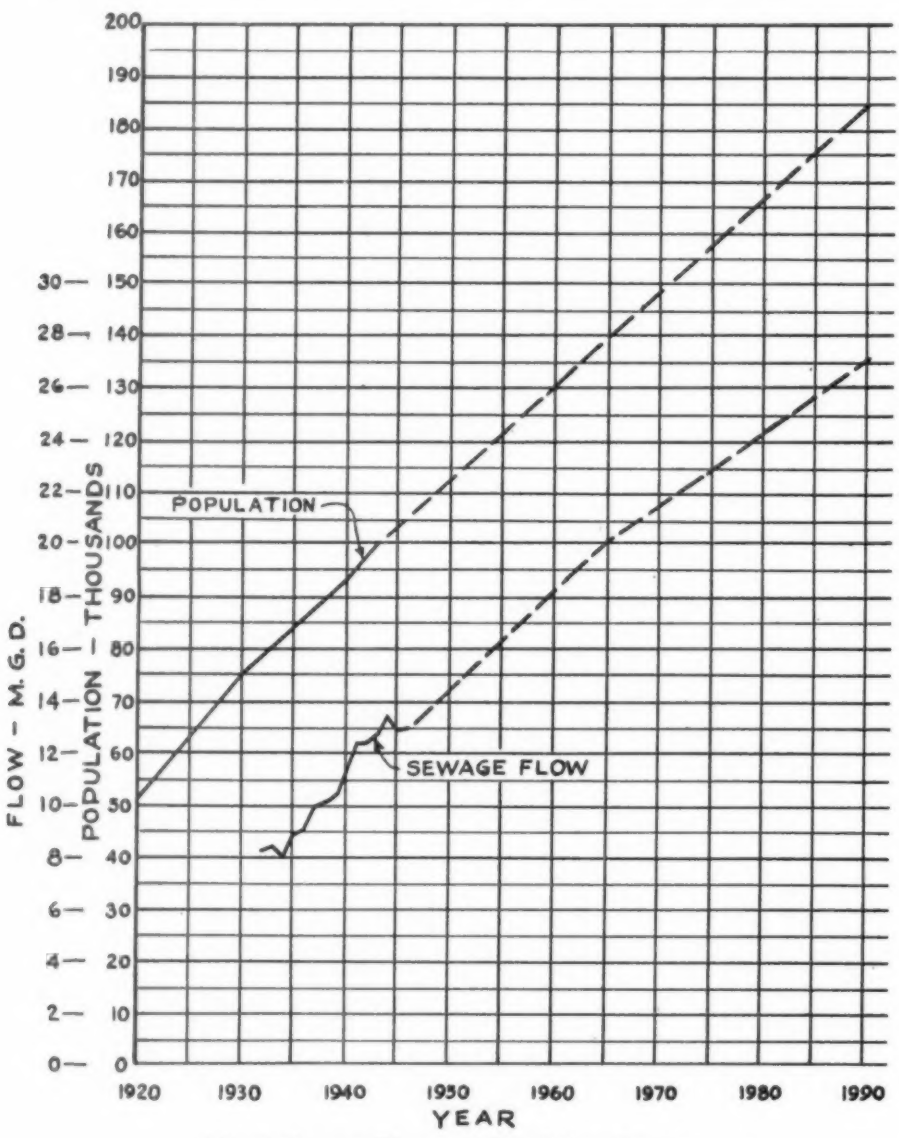


Fig. 2. Sewage Flow and Population Curves

Studies of past operating data indicate that a satisfactory effluent from the trickling filter plant could be obtained when the average flow to the filters was 4.7 mgd. Design capacities of 15.4 mgd. for 1965 and 22.4 mgd. for 1990 were therefore required by the activated sludge plant.

In the existing plant, the primary tanks for the trickling filter plant are about 13 feet higher than the primary tanks for the aeration plant. Decision to divide the collecting system into two parts opened the possibility of introducing the sewage from the new east side force main into the plant at the lower level. All sewage from the east side force main will be treated by the aeration plant. The existing west side force main enters the plant at the higher level. All sewage from the west side system in excess of that treated by the trickling filter plant will continue to flow down to the aeration plant. A considerable saving in pumping costs is anticipated by discharging the east side system at the lower level. The sewage flows in the east side system are estimated to be:

	1965	1990
Average—mgd.	10.7	14.3
Maximum—mgd.	21.0	29.2

The flows to the aeration plant are estimated to be:

	1965	1990
Average—mgd.	15.4	22.4
Maximum—mgd.	33.9	50.5

The District requires that wastes discharged into their sewage treat-

ment facilities shall have a strength not exceeding 250 ppm. B.O.D. This requirement is met by Oscar Mayer & Co. by operation of a preliminary treatment plant of the chemical precipitation type. These wastes, except for occasional periods of high activity at the packing plant, are discharged within the prescribed limits, but they are unusually low in suspended solids, with most of the B.O.D. load in soluble or colloidal form. As a result, the packing plant wastes cause little additional load on the preliminary settling tanks, but do cause increased load in the secondary treatment processes.

Difficulties with bulking sludge and light, flocculent solids in the aeration plant suggested a conservative basis of design for some of the major treatment units. The values adopted are summarized in Table I.

Long Term Plan

It is well established that it is not economical to construct such facilities as sewage treatment works, which are easily extended, for requirements greater than about 20 years in the future. It is necessary, however, that such construction be planned so that future additions can be made with maximum use of existing structures and minimum interruption of operation.

Consequently, the long term planning includes two major construction programs; the first to include additions to increase capacity to that required for 1965 conditions, and the second to include additions required for 1990 conditions, at which time the capacity of the Nine Springs site is expected to be reached. The layout adopted showing additions contemplated in the progressive program is shown in Fig. 5. Major units required are shown in Table II.

The 1965 program also includes revisions in the present Sludge Control Building to provide circulation of the contents of the digestion tanks once every 36 hours. In connection with these changes, a sludge heat exchanger is contemplated to supplement and possibly replace the existing heating coils in the tanks.

In general, the design of treatment structures and equipment will follow conventional practice, but certain features are worthy of special mention.

Flocculation Tanks

Provision has been made in the plant layout (see Fig. 5) for the inclusion of flocculation tanks between the new grit chamber and the aeration plant to give a short period of aeration (15-30 min.). It is expected that these tanks will effect a freshening of the sewage, creating aerobic conditions and an environment suitable for the development of the organisms desired in the secondary treatment. Flocculation of fine suspended solids also should improve grease separation and solids removals in the primary tanks. These advantages will be particularly helpful in the treatment of the east side sewage, inasmuch as it will include the Oscar Mayer & Co. effluent, which contains a high proportion of very fine suspended solids.

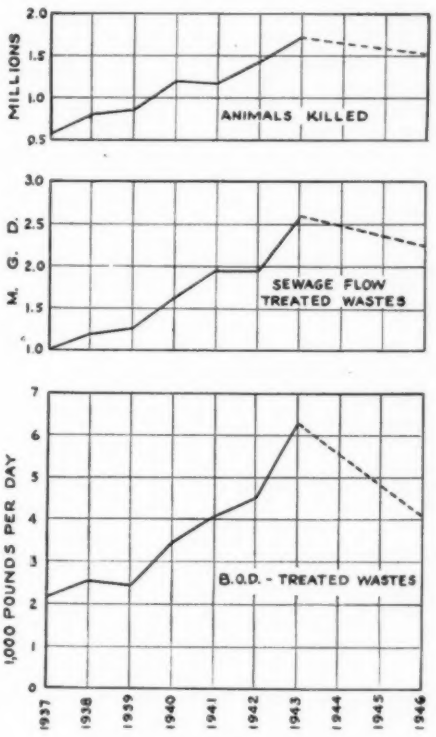


Fig. 3. Operating Data

Some consideration has been given to the introduction of waste activated sludge into the flocculation tanks to provide nuclei for the formation of a floc and to improve the removals in the primary tanks.

Primary Settling Tanks

Following current practice in the design of primary tanks preceding aeration, a displacement period of 1.5 hours, based on average yearly flow, has been established. A longer displacement period would be of little value in suspended solids and B.O.D. removals, and might even result in a stale sewage less favorable for the growth of aerobic forms.

It is contemplated that all new primary tanks will be equipped with outlet troughs located some distance from the downstream end of the tank. By reducing the overflow rate and the velocity of flow in the vicinity of the effluent weirs, there will be less tendency to lift the finer solids and more of them should be retained in the primary tanks. Provision will

Table II

MAJOR UNITS REQUIRED IN CONSTRUCTION PROGRAM

	1965	1990
Grit Chambers with removal mechanisms ..	2 channels, max. capacity each 15 mgd.	
Flocculation Tanks	2@15,000 cu. ft. each.	
Primary Settling Tanks	2@31,000 cu. ft. each.	2@31,000 cu. ft. each.
Aeration Tanks	3@210,000 cu. ft. each.	2@210,000 cu. ft. each
Outfall Structure	To be built in construction program for 1965 conditions.	
Aeration Control Building	To be built in construction program for 1965 conditions with provisions for ultimate future equipment.	
Blower Building	Additions to be built in construction program for 1965 conditions with provisions for ultimate future equipment.	
Blowers	2@4,500 cfm. each, motor driven.	1@6,750 cfm., motor and gas engine driven.
New Sludge Control Building	To be built in construction program for 1965 conditions with provisions for ultimate future equipment.	
Sludge Thickening Tanks	1@7,000 cu. ft.	1@7,000 cu. ft.
Elutriation Tanks	2@18,000 cu. ft. each.	
Sludge Disposal Building	To be built in construction program for 1965 conditions with provisions for ultimate future equipment.	
Vacuum Filters	2@400 sq. ft. each.	1@350 sq. ft.
Administration Building	To be built in construction program for 1965 conditions.	

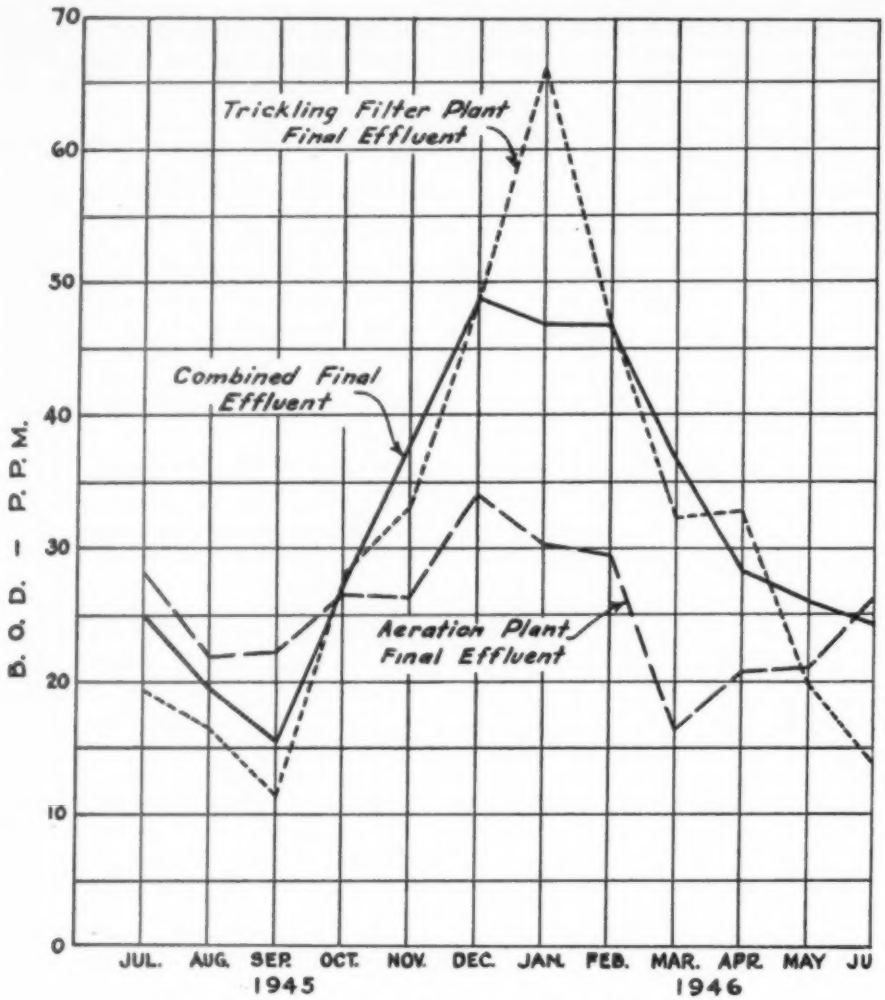


Fig. 4. B.O.D. of Final Effluent at Nine Springs Plant

be made to erect a second set of troughs, should this prove desirable.

Aeration Tanks

To obtain the required capacity of aeration tanks within the restrictions of the plant site, larger and deeper tanks than those now installed were adopted. Increased depth is made possible without increase in blower pressures by use of swing diffusers located 2 feet above the tank bottom. Use of the swing diffusers will permit maintenance of the diffuser system without taking a tank out of service, and eliminates the necessity for spare capacity for this purpose. All meters for the measurement of air and mixed liquor will be located in a gallery at the effluent end of the tanks where they are readily accessible for maintenance and repair. The larger size tanks require less steel and concrete per unit volume of tank and should result in reduced unit costs.

Valves, piping, and pumping facilities will be provided to permit use of any part or all of the original aeration plant as a separate experimental unit independent of the operation of the remaining aeration and final settling tanks.

Sufficient capacity will be provided to permit operation of the experimental unit over a wide range of flows in order that the optimum conditions for treatment of the sewage reaching the plant may be ascertained.

It is anticipated that, in providing ample flexibility, procedures may be developed for better treatment of the sewage high in soluble and colloidal organic matter, better means of disposal of thickening tank overflow and digester supernatant, and improved clarification in the final settling tanks.

Aeration Control Building

Return sludge pumps with capacity for 100 per cent return sludge will be located in the new aeration control building. Piping and connections will be so arranged that one or more pumps may be isolated from the return sludge system and used for unwatering primary tanks, aeration tanks, or final tanks. Rapid unwatering will permit minimum outage of these units and further reduce the need for spare capacity.

All meter registers for control of sewage, mixed liquor, and return sludge flow in the plant will be assembled in a single panel in the aeration control building.

Return Sludge Chamber

Uniform distribution of return sludge to all aeration tanks is assured by introducing the effluent from all primary tanks serving the aeration plant and the return sludge into a common mixing chamber from which the mixed liquor is distributed to the aeration tanks. Open conduits have been used wherever possible in the plant design to reduce head losses and maintain suitable velocities over a wide range of flows. Some aeration will also result from contact of the sewage surface with the atmosphere and tend to keep the sewage fresh.

It is also contemplated to provide separate return sludge connections and primary tank effluent control to certain aeration tanks to permit experimentation without changing operation of the major units of the activated sludge plant.

Final Settling Tanks

For some time, it has been observed that the high overflow rates of the peripheral weirs in the final settling tanks and their location in the zone of density current upturn has resulted in the loss of considerable amounts of light, flocculent solids over the effluent weirs and unnecessarily high suspended solids in the final effluent. To avoid these difficulties, all new and existing final tanks will be equipped with effluent troughs located some distance inside the tank wall. These troughs will greatly increase the available weir length and will be out of the zone of density current upturn. A consequent reduction in suspended solids and B.O.D. in the final effluent is expected.

Outfall Structure

To dissipate the "loose" head between the final tanks and the receiving waters and to provide aeration for the plant effluent before it is discharged into the stream, a new outfall structure, incorporating a cascade spillway, will be employed. This will be located beside the road near the plant entrance and will discharge into a wide channel emptying into the creek.

Sludge Thickeners

Past operating experience has indicated the desirability of including sludge thickening tanks to concen-

trate the raw and waste activated sludge as much as possible before adding it to the digestion tanks. Past experience also indicates a tendency for activated sludge of high sludge index to gasify in the thickeners, lifting the whole mass of sludge to the surface and permitting large amounts of solids to escape over the weirs. Addition of small amounts of lime to the thickeners has been used in the past to keep down the sludge blanket, and this treatment or some other standard practice can be employed again if necessary.

Sludge Disposal Facilities

Existing sludge digestion facilities include three heated primary digestion tanks, two with floating covers and one with a fixed cover and two unheated secondary digestion tanks with gas holders. Digested sludge is dried on sludge drying beds, in sludge lagoons, or is pumped to a marsh adjacent to the plant. Gas resulting from the digestion of sludge is utilized in heating boilers and in gas engine driven blowers, and the jacket water from the engines is circulated through heating coils in the primary digestion tanks.

For some years, little concentration of the raw sludge has been accomplished in the digestion process and it has not been possible to withdraw any real supernatant. The resulting digested sludge has been thin, in some cases only partially digested, and difficult to dewater. All these symptoms indicate overloading of the digestion facilities in spite of the fact that the indicated load is only about 1.25 pounds of raw solids added per cubic foot per month.

Objectionable features of the present sludge disposal situation include the following:

(1) Partially digested sludge disposed of to open sludge beds and lagoons creates an odor nuisance, attracts flies, and detracts from the appearance of the plant.

(2) Failure to obtain reasonably complete digestion of the raw sludge represents a loss of potential gas production.

(3) Poor drainability of the sludge requires large areas devoted to sludge dewatering.

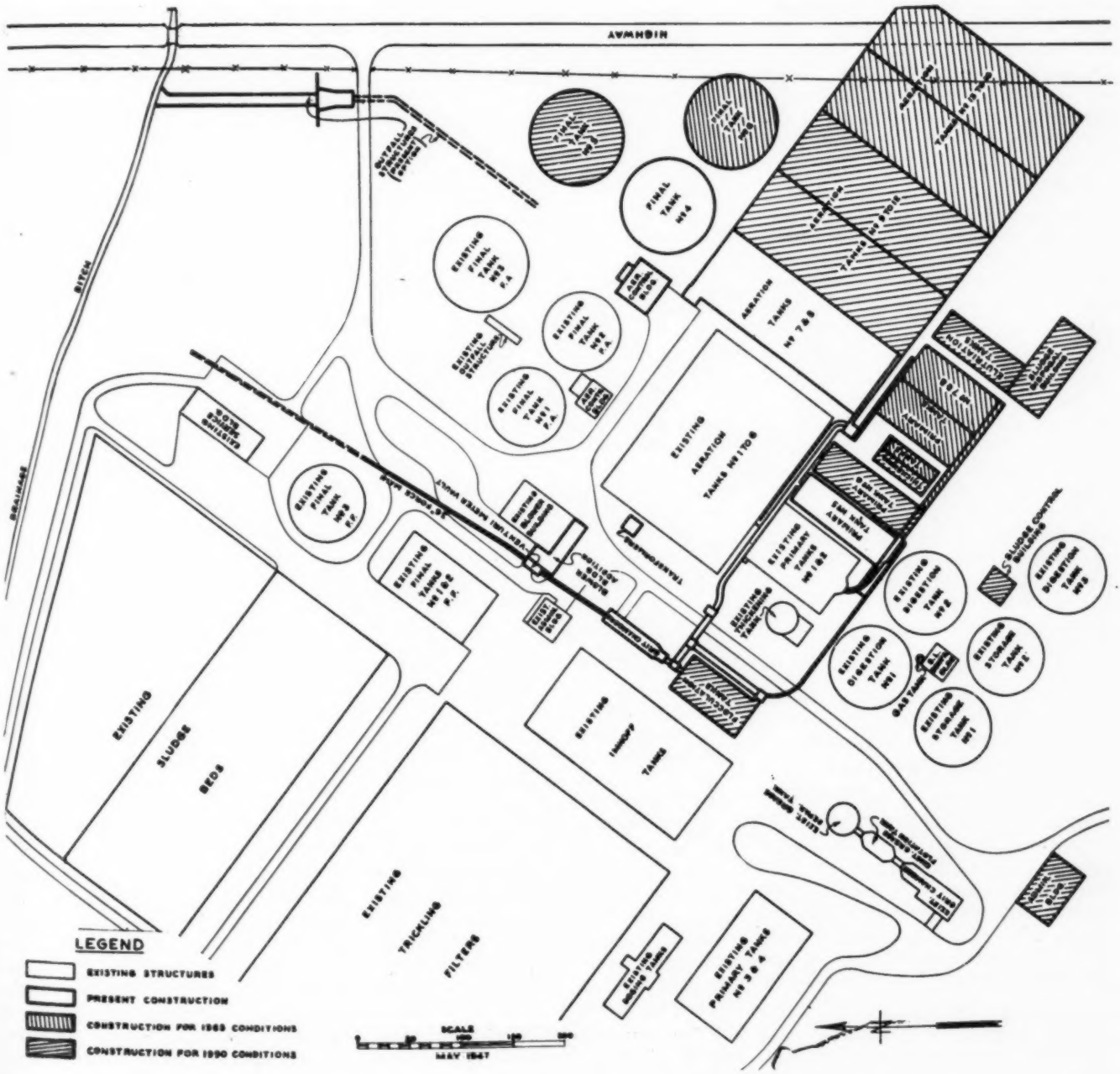

AVAMBIN
RIVER
BRAINARD
EXISTING SLUDGE BEDS
EXISTING TRICKLING FILTERS
EXISTING AERATION TANKS NO 1 TO 6
EXISTING PRIMARY TANKS NO 1 & 2
EXISTING DIGESTION TANK NO 1
EXISTING DIGESTION TANK NO 2
EXISTING DIGESTION TANK NO 3
EXISTING STORAGE TANK NO 1
EXISTING STORAGE TANK NO 2
EXISTING PRIMARY TANKS NO 3 & 4
EXISTING FINAL TANK NO 1 P.A.
EXISTING FINAL TANK NO 2 P.A.
EXISTING FINAL TANK NO 3 P.A.
EXISTING FINAL TANK NO 1 & 2 P.C.
FINAL TANK NO 3
FINAL TANK NO 4
AERATION TANKS NO 7 & 8
AERATION TANKS NO 9 TO 12
SLUDGE CONTROL BUILDING
LEGEND
EXISTING STRUCTURES
PRESENT CONSTRUCTION
CONSTRUCTION FOR 1960 CONDITIONS
CONSTRUCTION FOR 1990 CONDITIONS
SCALE
MAY 1947

Fig. 5. Plant Layout Showing Existing and Planned Structures

(4) Failure of sludge to concentrate during digestion requires a large volume of digestion tank capacity devoted to storage.

Facilities for Overcoming Sludge Difficulties

It is planned to overcome these difficulties and obtain better control over the digestion process by adding the following facilities to the existing installation:

(1) External heat exchangers.
(2) Auxiliary boilers.
(3) Circulating pumps.
(4) Elutriation tanks.
(5) Vacuum filters.

Use of external heat exchangers will provide more uniform temperatures in the digestion tanks and better control of the heating process. They will also permit use of *all* existing tanks, for primary digestion. Proper seeding of the raw sludge will be obtained by mixing it with digesting sludge and circulating the mixture through the heat exchangers before introducing it into the digestion tanks.

Heat for the heat exchangers will be obtained by circulating the jacket water from the engine driven blower. Any deficiency in the heat thus supplied will be made up by boilers located in the sludge control building.

Pump capacity sufficient to permit recirculation of the digestion tank contents every 36 hours will assist in maintaining uniform conditions throughout the tanks and can be used to inhibit the separation of scum blankets at the top of the tanks. It will provide means for recirculating the digesting sludge through the heat exchangers and mixing it with the incoming raw sludge and will provide for rapid transfer of sludge between tanks or disposal to the beds and lagoons.

Installation of the vacuum filters will eliminate the need for sludge storage facilities and permit use of all the existing tanks for primary digestion. Nuisance from sludge now disposed of in the marsh will be avoided. Necessity for additional large areas devoted to sludge beds and lagoons will be eliminated and the general appearance of the plant will be improved. Sludge disposal will proceed on a regular schedule throughout the year, and the problem of securing seasonal labor to clean large areas of sludge beds will be avoided.

Elutriation tanks are expected to effect some concentration of the digested sludge by separation of the sludge solids from the supernatant. A second means is thus provided for the disposal of supernatant besides its use in sludge conditioning tanks to improve the characteristics of the activated sludge. Used in conjunction with the vacuum filters, elutriation tanks should materially reduce the chemical dosage required for sludge conditioning prior to vacuum filtration.

Blower Building

Additions to and revisions in the existing Blower Building are contemplated as follows:

(1) A new south wing to include a machine shop, office, new electrical room, and a new boiler room.
(2) Revision of blower piping and air filters to provide better inlet and discharge conditions for the blowers.
(3) Addition of a heating and ventilating system to provide adequate fresh air circulation.
(4) A new north wing to provide space for additional blowers.

Administration Building

The present Administration Building is somewhat inadequate for present and future operations. A new Administration Building is contemplated of sufficient size to include adequate laboratories, District and plant offices, file rooms, meeting rooms, lunch rooms, and toilets.

Considerable flexibility to meet varying operating conditions has been provided in the over-all plant design. Conduits and piping are so arranged that operation other than normal is provided for as follows:

(1) By-passing sewage flow after grit removal.
(2) By-passing aeration tanks after primary treatment.
(3) By-passing primary tanks and introducing raw sewage direct to aeration tanks.

Construction Schedule

In view of present construction costs and conditions, it did not seem advisable to proceed at once with a construction program as large as that required to provide for 1965 requirements. On the other hand, some revisions and additions to the plant are required immediately to insure proper treatment. Consequently, a smaller immediate construction program was set up to meet the requirements for the next few years without prejudicing the long term plan for plant expansion. The items in the 1965 program selected for immediate construction are as follows:

Grit Chamber
One Primary Settling Tank
One Aeration Tank
One Final Settling Tank
Aeration Control Building
Blower Building Additions
Sludge Control Building Revisions
New Outfall Structure

Plans and specifications for this immediate construction are nearing completion, and it is expected that contracts for this work will be awarded within the next year.

New Manual of Recommended Water Sanitation Practice

The U. S. Public Health Service is making available a new "Manual of Recommended Water Sanitation Practice." This will appear as Public Health Bulletin No. 296. This manual originally appeared attached to the 1941 Drinking Water Standards. It was not included as part of the 1946 Drinking Water Standards.

According to the U. S. Public Health Service, the material was originally prepared for use by sanitary engineers in the Service in evaluating sanitary features of water supplies with which they are concerned. It is felt, however, that the manual may also be useful to state, city, county health departments, and other agencies.

Public Health Bulletin No. 296 was prepared by the Sanitary Engineering Division, including the Water and Sanitation Investigations Station in Cincinnati of the U. S. Public Health Service. Others cooperating were the state sanitary engineers and the men in the field of water treatment.

The manual covers physical features of water supply systems and their sanitary protection, recommended sanitary requirements for water treatment and water distribution systems, and chemical and bacteriological requirements for potable water. The procedures outlined in the manual are not mandatory, according to the U. S. P. H. S. and do not rule out other practices.

A limited number of free copies is available for persons directly engaged in water works sanitation. Write to the Public Inquiries Section, Office of Health Information, U. S. Public Health Service, Washington, D. C. Additional copies in quantity may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents per copy.

DISPOSAL OF INDUSTRIAL WASTES IN LOS ANGELES COUNTY*

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LOS ANGELES COUNTY ENGINEER'S OFFICE

INDUSTRIAL development now taking place in the Los Angeles metropolitan area has few, if any, parallels in world history. Major industries of all types recognize the importance of the Western and Pacific markets and are establishing branch factories in Southern California. Other large industries are transferring their entire activities to the Coast. These major industries in turn create other industries which manufacture essential parts for them or refine and distribute their products.

General Requirements for Industrial Waste Disposal

Authoritative analysts believe that Los Angeles will become the center of the largest metropolitan population in the world. Industries of every description, including those having to do with food processing, are essential to this development and should not be subjected to needless regulation and control. Accordingly, the Los Angeles County laws regulating disposal of industrial wastes are concise and direct. They are designed to accomplish four primary objectives:

1. Wastes shall not be allowed to create a public nuisance or be a menace to public health and safety.

2. Wastes discharged into natural or artificial drains and streams or onto land shall not contaminate or pollute the underground waters from which are obtained a major portion of domestic, industrial, and agricultural water supplies.

3. Wastes discharged into the public sewers shall not damage the sewer or unreasonably increase costs of maintenance and operation of the sewer system.

4. Wastes discharged into the public sewers shall not disrupt operation of sewage treatment plants or cause the treated sewage from such works to violate the first two conditions previously mentioned.

When industrial management has recognized that County Enforcement Agencies are concerned only with the enforcement of regulations necessary to securing the foregoing objectives, they have been most cooperative. Difficulties occur only when management does not understand the need for some regulations and cannot justify the expense of installing facilities for such control.

Most violations of county regulations are unintentional. Many are due to the lack of advanced planning, changes in processes at existing plants, or changes in local conditions adjacent to the industries. In most cases, management will correct the unfavorable condition when called to its attention. In this connection, it has been found that typical examples are very effective in demonstrating the need for specific regulations and controls.

Regulations for Protection of Public Health & Safety

Disposal of wastes in a manner affecting public health and safety is frequently not detected until revealed by serious damage or accident. One of the few fatalities among workers in the County Storm Drain System was caused by illegal discharge of wastes from food processing plants into a storm drain instead of the adjacent sanitary sewer. Workers attempting to locate the source of these illegal discharges were overcome by hydrogen sulphide gas. The gas was generated by decomposition of organic wastes from the industries. Four men were hospitalized, one died without regaining consciousness.

In another case, a public nuisance was created by a plant engaged in washing and packing celery for market. For years this company has discharged clear water from its celery washing into an adjacent drainage channel. Unfortunately, the channel does not have an adequate outlet and water spreads out over a wide area, creating a marshy condition ideal for breeding mosquitoes. These mosquitoes have become a serious nuisance because of residential development of areas adjacent to the marshy land. A Mosquito Abatement District has been formed and this district has filed an action against the company for abatement of the nuisance. The company in turn has filed an application for permission to change its method of waste disposal.

Regulations for Protection of Underground Waters

The second regulation affects only those industries which are unable to dispose of all wastes into the sanitary sewers. Such industries include the very large users of water, as well as plants in suburban districts where sewers have not yet been constructed. Wastes from such industries must be treated before leaving the industrial plant so as to safeguard underground water supplies from contamination or pollution.

The importance of this regulation is apparent when the geology of the Los Angeles Coastal Plain is understood. A major portion of the water supply for the entire metropolitan area is obtained and must continue to be obtained from great underground reservoirs or aquifers which exist directly beneath the area. Some of these aquifers are only a few hundred feet in thickness, others more than 1,500 feet thick.

Geologists state that in prehistoric times the Coastal Plains were deep lakes or valleys and that the adjacent mountains were more than 30,000 feet high. Through the ages these great valleys and lakes have been filled with sand, gravel, clay and earth washed down from the mountains by rushing streams. As a result of this geologic change, our mountains are only from 5,000 to 10,000 feet in height and our valleys and lakes have been filled with alluvial material, and the resulting underground storage reservoirs are a major, natural asset. They supply most of the area with water and their continued usefulness is dependent on maintenance of the character and quality of the water which they contain.

Unfortunately, in past years there has been a lack of control over the discharge of industrial wastes into these underground basins and important aquifers have been seriously damaged.

For years, industries have moved into suburban areas, purchased large

*A paper presented at the Conference of the Institute of Food Technologists, Southern California Section.

tracts of relatively cheap land and put down wells to obtain an ample supply of water for their operations.

The land was often cheap because of the lack of sanitary sewers and other municipal facilities. This was no obstacle when plant wastes could be dumped out on the land or returned to the ground through cesspools or sewer wells. In many instances, such wastes have contained chemicals and various other impurities which have seriously affected valuable water supplies.

In some cases, these supplies have been rendered unfit for domestic, industrial or agricultural use; in other cases, expensive treatment of the water has been necessary to eliminate objectionable tastes, odors, or toxic characteristics. Major damage to the underground supplies has been due to the operation of plants using or making large amounts of chemicals and not to the food industries. Frequently, however, the food industries employ chemicals which are harmful and may cause serious damage. For example, citrus packing plants and other food processing industries use large quantities of boron in fruit and vegetable washing operations. Citrus and walnut trees cannot live when irrigation waters contain more than 0.5 ppm. of boron. Valuable orchards in Los Angeles County, Ventura County and other sections of California have been seriously damaged as a result of irrigation with boron polluted waters. While industry has not been responsible for presence of boron in most of these cases, the menace has been recognized and at least in several cases industrial wastes have been responsible.

Frequently auxiliary operations of an industry cause trouble when least expected. For example, six water wells were recently destroyed by waste saline brines from a small water softening plant, which provides water for boilers and other industrial uses. These wells penetrated an aquifer at a depth of 250 feet and provided the only supply for a small community and a public school in this county. In this case a hydrographic survey made by the County Engineer showed conclusively that the brines were the source of pollution. The industry responsible for contaminating the water supply is now installing a pipe line and other facilities to serve domestic water to the affected area until the wells are restored.

In many cases installation of proper facilities will enable a plant to dispose of wastes which might otherwise prove dangerous. Polluted waters are usually a small part of the total discharge of waste from an industry. Frequently the suspected waste can be segregated for separate disposal at small cost.

There are certain chemical wastes which should not be disposed of near water-bearing aquifers for obvious reasons. Industries processing materials which produce such wastes should locate where facilities for safe disposal are adequate and assured. Among such dangerous wastes are boron, chromates, certain hydrocarbons, sulphuric and other acids in large quantities, chlorides and salts of some of the heavy metals. Some of these chemicals, such as the phenols and chromates, are very soluble in water and are toxic in minute concentrations. For example, an ounce of trichlor-phenol dissolved in 2.5 million gallons of water may contaminate the supply to such an extent that it cannot be used for domestic purposes without expensive treatment. Boron and the sulphates have an affinity for the soil but are also water soluble. Damage from such wastes is not immediately apparent, but a water supply seriously contaminated may not recover its original quality for years or even centuries.

Regulations for Protection of Sewers

The third and fourth regulations affect only those industries which are connected to sewage systems. Obviously, wastes which will damage public sewers cannot be discharged therein. Likewise, unreasonable increase in cost of maintenance and operation or disruption of the operation of sewage treatment facilities cannot be allowed. If, however, wastes from an industry will not create any of these conditions, they are admitted to sewers in the county without special pretreatment.

Disposal of Garbage into Sewers

One plant in the county is making sauerkraut and must dispose of two tons of cabbage leaves per day 300 days per year. This plant is on a sewer of ample size which carries a rather constant flow of sewage at all times. After investigation of all factors, this plant was allowed to install a garbage grinder and dispose of all its waste including the ground-up cabbage leaves into the sewer. In a somewhat similar instance, a garbage grinder was installed to permit disposal of some four to six tons per day of peach and apricot pits during the canning season.

Difficulty is being experienced in the operation of an industry which packages and freezes many types of fruits and vegetables. Waste water from this industry, which amounts to more than 1,000 gpm., is at present discharged into an open storm drain, which passes through several high class residential areas. Although every effort has been made to discharge only clear water into the drain, complaints of odors and flies have been numerous during the summer months. A relief sanitary sewer will be built to serve this plant and other adjacent industries, and when connection is made to this sewer, it is probable that company officials will want to discharge their garbage direct into the sanitary sewer. A garbage grinder which could be used for this purpose has already been installed to facilitate loading of this garbage into trucks for disposal. Solid wastes from this plant are great in weight and volume. Only perfect vegetables and fruits are packaged and frozen. Others are discarded and must be disposed of as garbage. During the spinach season, waste leaves and other solid matter exceeds 30 tons per day. Disposal of this quantity of solid material into the sanitary sewer will constitute a rather difficult problem. Another problem at this plant has to do with the quantity of water used; 1,000 gpm. is a lot of water to waste and the company may be required to install facilities for recirculation and cooling.

Effect of Cooperage Wastes in a Small Sewer

These are wastes which may be permitted in the sewers when capacity of the sewers is great and treatment plant operation will not be seriously affected. When the sewer is small or heavily loaded, special facilities are frequently required at relatively small industries. For example, a small cooperage plant, on one county sewer, cleans and renovates about 700 barrels or drums per day. It was estimated that this plant contributed at least 400 lbs. of grease per day to the sewer. Due to the use of steam and caustics in drum cleaning operations at the plant, this grease is highly emulsified. Tests have shown that more than 90 percent of the grease remained in solution after 24 hours of settlement in a cesspool or grease trap. Although many cesspools and traps were constructed, very little of the

emulsified grease was prevented from reaching the sewer.

Unfortunately when the wastes from this plant reached the sewer, a quick change in pH occurred and the grease precipitated in a hard mass on the walls of the sewer pipe. This quickly clogged the sewer with the resultant stoppage and disruption of operation at industrial plants up and down the street from the cooperage.

The grease was exceedingly difficult to remove from the sewer, which had to be cleaned every few weeks at excessive cost. The industry has made extensive engineering studies in an attempt to solve the problem without success; consequently it has been forced to segregate its waste water and haul away all material collected in its cesspools and grease traps, allowing only relatively clear water to enter the sewer. This method of operation is extremely expensive to the industry and every effort is being made to work out another more satisfactory solution.

Meat Canning Plant on a Small Sewer

At another plant which is canning horse meat for human consumption there is a different problem. All the sewers adjacent to this plant are small and are loaded to capacity. Retorts in which the canned meat is cooked with steam must be cooled with water. When the retorts are dumped for the removal of the cans after cooling, peak flows may reach 2,000 gpm. for a short period of time. Some difficulty was experienced in convincing the plant owner that he would have to change his plan of operation and install a regulating basin so as to equalize flows from the plant and prevent sewage from backing up and overflowing into streets in the area.

Protection of Sewage Treatment Plants

There are many kinds of wastes which will disrupt the operation of a sewage treatment plant so that the fourth regulation is very important.

An unforgettable incident of this sort occurred at the sewage treatment plant in the town of Shafter, which is located in the heart of the San Joaquin potato belt. Shafter is a modern progressive town and has a modern efficient sewage treatment plant. One of the big problems in this area is the stabilization of market prices on potatoes during the peak of the season when storage and transportation facilities are often inadequate to meet demands. For this reason, city officials welcomed a new industry which would purchase surplus potatoes for dehydration. There was a great deal of favorable publicity and the industry was allowed to connect to the city sewer for a monthly service charge of $1.50.

Soon after the plant started operation, a serious odor nuisance developed at the sewage treatment plant some four miles from town. Investigation showed the treatment plant itself, as well as 15 or 20 acres of surrounding land was covered with 6 or 7 feet of odorous bubbles caused by the saponification of the wastes from the potato dehydration plant. City officials immediately disconnected the company from the sewer and the company promptly went bankrupt. The sad part of this story is that properly engineered pretreatment facilities would have removed objectionable solids from the plant wastes at reasonable cost and would have prevented the loss of this essential industry to the community and its owners.

Problems of the New Industries

Disposal of industrial wastes is one of the most difficult problems confronting the average industry planning to locate anywhere. Frequently, it is more important than available markets, labor conditions, transportation facilities, or tax rates. All too often the subject of waste disposal is given inadequate attention. One industry is just completing a new plant at a cost of $2,500,000 in one of the coastal cities. Officials of the company have just discovered that there is serious question as to whether or not they can dispose of their industrial wastes at this location and consequently, whether or not they can operate the new plant.

Such experiences are not isolated. Not long ago, officials of a large food processing industry came to the County offices to discuss waste disposal facilities available at various industrial sites in the county. This company has an existing plant in one of the coastal cities which represents an investment of almost $1,000,000. Their wastes are difficult to handle and the adjacent city sewers are too small to carry the load. Officials of this company stated that they were frequently shut down because of sewer stoppages and that operations at the existing plant had been so seriously affected that they were forced to seek a new location where waste disposal facilities were adequate.

Need for Competent Engineering

Many such cases are not due to inadequate sewers or disposal systems, but to lack of competent engineering advice and failure to install needed pretreatment facilities.

One industry was forced to move from one of the smaller cities because their wastes disrupted operation of the sewage treatment plant. Officials of this company, which was processing citrus by-products, took samples of their wastes to the City Engineer of another city whose sewage treatment plant was similar in size and design to that of the community they were leaving. This City Engineer understood the operation of his sewage plant and after analysis of the waste disposal problem, assured the company officials that his plant would handle their wastes if the plant would locate in a designated area of the city and install pretreatment facilities.

Many such examples in all sections of the United States demonstrate the need of adequate waste disposal facilities. Consequently, officials of many industries planning to locate in the Los Angeles metropolitan area come directly to the county offices of their own accord or at the suggestion of realtors and Chamber of Commerce officials to discuss waste disposal problems. Such visitors are welcome and are given complete information regarding waste disposal problems affecting any site they are considering in territory under county jurisdiction.

New Industries Must Have Plans Approved

Another contact with new industries occurs when plans are drawn and application is made to the County Building Department for construction of the buildings. Under provisions of the Los Angeles County Industrial Waste Ordinance, all such building applications are screened and any plants having a waste disposal problem are required to secure a clearance from the County Engineer before a building permit is issued.

After about two years of operation, it has been found that this screening is effective and that 65 per cent of all industrial type buildings are easily cleared as having no special waste disposal problem. Most of the remaining 35 per cent require some relatively simple pretreatment facility, and only 5 per cent have really serious waste disposal problems. In these few cases, detailed plans and specifications are required.

When other governmental agencies may be affected, they are contacted and any permit issued by the County Engineer contains conditions of all affected departments and agencies. It has been found that industry is especially appreciative of this service which often eliminates serious future complications, to say nothing of the need to contact other governmental agencies.

In the few cases where special treatment facilities are required of an industry, the plans must be approved by the County Engineer and construction inspected by either the County Department of Building and Safety or the County Engineer. Unnecessary duplication of inspections is prevented by close cooperation between the two departments.

Existing Industries Affected by Regulations

These regulations affect every industry having a serious waste disposal problem and all existing industries which materially change their process or plant operation. All existing plants have been granted an automatic permit under the County Ordinances and need not be concerned unless one of the basic regulations is violated. To prevent violations at existing industries, there is close cooperation between the various departments, which include the County Health Officer, the Flood Control District, the Sanitation Districts, the County Engineer, and other enforcement agencies of the metropolitan area.

At the present time the County Engineer is responsible for maintenance of about 750 miles of main line sewers in 50 sewer maintenance districts scattered throughout the unincorporated area of the county. About 250,000 persons and 5,000 industrial type buildings are connected to this sewer system. About 1,000 of these industries have pretreatment facilities which are constantly checked by maintenance inspectors for compliance with county regulations.

Facilities at plants which are not connected to the sewers are also inspected for disposal wastes liable to create a public nuisance or affect character and quality of water supplies.

Cooperation With Industry

All of this work has stressed cooperation with industry and management so that a clear picture of the problem may prevent misunderstanding. In dealing with industrial management, it is assumed that the intrialist is concerned with manufacture of a product for sale and is not particularly interested in the disposal of process wastes except as to cost and interference with plant operation. On the other hand, the Sanitation Division of the County Engineer's office is concerned with disposal of wastes in the most efficient and economical manner. If management understands and complies with the four basic regulations established, the office can function efficiently without interfering with industrial operations and without resorting to administrative controls or to court action.

The Los Angeles County Engineer's office is concerned only with the unincorporated areas of Los Angeles County. It operates under the County Industrial Waste Ordinance No. 614 and the County Sewer Ordinance No. 1396 as well as the State Health and Safety Code and other statutes. Copies of the Ordinances are available to any who may be interested and can be obtained by writing to Alfred Jones, County Engineer, Civic Center Building, Los Angeles 12, Calif.

CARE AND MAINTENANCE OF VALVES AND HYDRANTS*

By PEDER AMUNDSON
Fargo, North Dakota

Among the most important items in an up-to-date water works system is the care and maintenance of the gate valves and hydrants: gate valves for controlling the system of feeder and branch mains and hydrants for fire protection and street flushing. If either of these are not in top working order and cannot be depended on, they are worse than useless and can be the cause of a great deal of damage.

Gate valves, when working properly, should be easily opened or closed with the assurance that they really are closed all the way or opened all the way, as the case may be. We operate all of our gate valves at least twice a year; that is, we close them and open them again. Those that turn too hard or otherwise work improperly are usually found to be in need of new packing. In time the old packing becomes brittle and grips the valve stem, making it hard to operate. We use a square braided flax or jute packing which we have found to be the most satisfactory up to the present time. The twelve inch and larger gate valves are inclosed in brick manholes for easier access. We have metal hoods fitted over the tops of geared valves to prevent dust and dirt from clogging the gears.

We have a complete record of the location of every gate valve, showing the year it was installed, size of the valve, and ties to its location which can be used when the ground is covered with snow as well as when bare.

The importance of having plenty of gate valves in a system is fully realized when it becomes necessary to close down a small section of the system for repairs or whatever the case may be. A small area can be shut off without affecting the surrounding territory. We also have a gate valve between each hydrant and the main.

Hydrants, in this part of the country, present more problems of maintenance than do those in warmer climates. Each fall before cold weather sets in we examine each hydrant for proper valve seating, proper draining, and leaks around valve stems and hose nozzles. We have a chain with a weight on one end which we lower through one of the nozzles into the hydrant barrel to test for water in the hydrant. In case water is found to be present, we remove it with a small hand operated rotary pump and determine why the condition exists, making such repairs as are necessary. They usually consist of checking the hydrant valve for improper seating or perhaps the hydrant hasn't been properly closed to insure the full openings of the drain valve. Where adjustments have to be made, a second inspection is made of that particular hydrant a couple of days later as a further check.

We have some difficulty with nozzle caps sticking during the cold weather. We have tried several different types of greases which we thought would not harden during very cold weather, but so far we have not found what we want. We are now using an automotive graphite grease which we hope will be the answer.

All of our hydrants are flushed out twice a year, once in the spring and once in the fall.

*From the official bulletin of the No. Dak. Water & Sewage Conference.

INDUSTRIAL WASTE DISPOSAL IN LOS ANGELES CITY*

By WARREN A. SCHNEIDER
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BUREAU OF MAINT. AND SANITATION
CITY OF LOS ANGELES

THIS discussion will cover the conditions which brought about legislation regulating the discharge of industrial wastes, the conditions embodied in such legislation, and the steps taken to make the Los Angeles city industrial waste regulations effective.

For years it was the practice of municipalities to allow the more or less indiscriminate discharge of industrial wastes into their sewerage systems, drainage systems, channels and rivers. This practice was based on the assumption that industrial wastes were in the category of sewage, and that they should therefore get rid of them as quickly and easily as possible by discharging them into the nearest available sewer, storm drain, channel or body of water. This custom was general until recent years and still prevails in some communities.

For the past decade, however, city, county, state and federal authorities have been becoming more and more cognizant of the many problems incurred because of industrial wastes and their disposal. The subject has now reached a place of highest importance in the field of sanitary engineering. After many years of indifferent or complete lack of attention, followed by awakening interest in this important problem, it appears that the disposal of industrial wastes is to at last receive the attention it deserves.

Attitudes Toward Industrial Wastes

This trend is evident in many ways: In the programs of various technical organizations and societies; in the requests of engineering and similar organizations to be addressed on the subject; in the work of various stream control and water conservation organizations; in state departments of health; in the advertising of various products suitable for industrial waste treatment; and in many articles appearing in trade journals, particularly those dealing with sewage and water supply.

The rapid industrialization of Los Angeles during the decade prior to the last war and also during the war has convinced many that this city and its environs is destined to become one of the leading industrial areas of the world and they are fearful that the price to be paid for this industrial development is to be excessive deterioration of liquid waste disposal systems, excessive treatment costs, the pollution of our surface and underground waters, and the pollution of our land and air.

As a result of this fear some have advocated the placing of legal barriers and restrictions to industrial development which would undoubtedly result in driving new industries away and the confiscation of existing industries. We are of the opinion that such a policy is ill advised. A prosperous, healthy community of our size must have industry, since without it we will be unable to employ the people who are already here, much less those who are yet to come. It is our belief that industry when properly advised of the problem, will cooperate and will willingly submit to reasonable regulations requiring pretreatment of harmful wastes prior to their discharge into the city's disposal facilities.

Waste Disposal Permits

In the City of Los Angeles the Board of Public Works is responsible for issuing permits for the disposal of industrial wastes into sewers, storm drains, or channels. That Board in turn has delegated the responsibility for investigating applications for such permits and the recommending of appropriate action to the Engineer-Director of the Bureau of Maintenance and Sanitation, one of the nine bureaus within the Department of Public Works. Within the Bureau of Maintenance and Sanitation the task of direct supervision of this work falls to the Industrial Waste Engineer under the general supervision of the Sewer Maintenance Superintendent.

All industrial waste permits issued are revocable. The usual grounds for revocation of such a permit is noncompliance with the conditions under which it is issued, or public necessity or convenience. Permits issued always state the specific conditions under which they are issued, but they are also, of course, subject to all of the general provisions of the Code not specifically mentioned. The specific conditions mentioned may include the size of the clarifier required to be installed, the necessity of providing neutralization or other pretreatment, the necessity of providing means of preventing storm waters from entering the sewers through the connection with possibly the specific method to be used therefor, and the maximum allowable amounts of certain substances which may be discharged into the sewers and drains.

Industrial waste permits require the payment of a ten dollar fee.

The major difficulties for many years past, incurred by the receiving of industrial wastes into sewers, storm drains or channels, were the overloading of sewers, the obstruction of sewers and storm drains from excessive solids or grease, the presence of explosive petroleum gases, objectionable odors from organic matter content, and in some few cases excessive deterioration of sewers and storm drain structures. These resulted in excessive maintenance and the receipt of complaints from the general public of disagreeable odors. The presence of petroleum gases obviously presented a serious hazard to our maintenance personnel, and also might cause explosion with consequent probable damage to our sewer facilities and possible injury to the public.

Limitations

In an effort to eliminate these troubles, Section 64.30, which is in Chapter VI, titled "Public Works and Property," of the Municipal Code, was amended in 1944 to provide that no person shall discharge into a sewer or storm drain any industrial waste, water, or liquid having a temperature greater than 100 deg. Fahrenheit, except on written advance permission of the Board of Public Works; that no person shall discharge or deposit into any sewer or storm drain any liquid waste containing by weight more than 600 parts per million of oil or grease, or containing by weight more than 1,000 parts per million of suspended solids, or containing any petroleum product or other product which by

*A paper presented before the Southern California Section of the Institute of Food Technologists.

reason of its nature or quantity may cause a fire or explosion, or in any way be injurious to persons or to sewers or storm drains or other appurtenances, or which has a hydrogen-ion concentration or pH of less than 5.5 (for acidity) or greater than 9.0 (for alkalinity). It also states that where practical, liquid wastes, waters or liquids, which are odorless, stable, and free from deleterious chemicals shall be discharged into storm drains or storm water channels.

There is also another section of the Municipal Code which is used in controlling the discharge of substances injurious, deleterious or dangerous to the health or well-being of human beings or animals. This is Section 38.01 of Chapter III, titled "Health and Sanitation," a section the provisions of which are enforced by city health authorities. This section is also used under certain conditions for the control of industrial wastes, as will be mentioned later.

Program of Investigation

Upon the revision of Section 64.30, the Public Works Section, we set out to carry out and enforce the terms of the new ordinance. We had only one employee, the Industrial Waste Engineer, to perform this tremendous task. There existed in the city an estimated 14,000 service stations, wash racks and garages, 380 laundries, 660 dry cleaning plants, 120 milk and milk processing plants, 160 plating plants, and many others aggregating nearly 30,000, which had been discharging all types of industrial wastes into our sewers and storm drains without adequate organized supervision or control.

Our first task other than to investigate and report on current applications was to clear up those relatively few places where we knew through our cleaning and maintenance operations that serious violations of the Code provisions were occurring. Programs and procedures for locating, checking and recording all other existing industrial waste connections were then prepared. The progress made was limited because of the lack of sufficient personnel to carry on such a large assignment. Such progress as was made, however, was encouraging. Industry proved to be very cooperative when the problem was properly explained.

In 1945 in order to carry on field inspections of existing installations we were able to obtain the loan of about four public works inspectors from the Bureau of Inspection during a period when construction of public works improvements was not active. It was understood that they were to be available for industrial waste inspections only when they were not needed for their regular duties. As a result of this arrangement, which lasted for about seven months, we obtained qualified assistance we otherwise would not have had and considerable progress was made on our program of surveying existing connections.

Problem of Clear Wash Waters

During the past few years we have also had considerable trouble from some industries such as bottling plants, etc., discharging large quantities of relatively clear and innocuous waste wash water into our sewers in the absence of nearby storm drains. In one industrial section of the City several of these bottling concerns discharge large quantities of such stable waters into 8-in. sanitary sewers constructed years ago when the district was purely residential in character and no one ever dreamed the area would some day be taken over by industry. The discharge of these large quantities of water into the small residential sewers soon caused the sewers in the area to become overloaded and we then immediately received complaints of sewage overflowing from manholes into streets, flowing out of sanitary fixtures in adjoining plants and flooding plant floors.

In March, 1945, the condition was promptly called to the attention of the City Engineer, who is responsible for the planning of and the institution of proceedings for sewers, storm drains, etc., and also for obtaining funds for their construction. It was suggested that he arrange for the construction of a relief sewer or an industrial waste connection to a storm drain several blocks distant, and that he arrange for the financing of such drain by means of (1) a local assessment district, (2) a voluntary permit issued to the companies responsible, or (3) some negotiated agreement between the city and the parties involved. It was also suggested that he secure, if necessary, an amendment to the Municipal Code which would make it possible to compel an industry to segregate relatively clear waters from other liquid wastes and sewage within its premises and to construct an industrial waste connection to a storm drain or storm water channel for disposal of such segregated clear waters. Conditions have since remained critical in this particular area and one large industry has moved from the area partly because of the unsatisfactory waste disposal conditions there.

An opinion has just recently been received from the City Attorney stating that an industry may be required to segregate its relatively clear, stable waters or liquids from sewage within or on its own premises for separate disposal through storm drains and this should be of considerable help in solving this problem. Furthermore, the citizens of Los Angeles have just authorized the issuance of ten million dollars worth of bonds for financing the construction of relief sewers badly needed in many districts of this city. This, too, will undoubtedly assist in relieving this and perhaps similar conditions elsewhere within the city.

The Montebello Incident

About 1945 a very serious result of improper disposal of industrial wastes was brought forcefully to the attention of sanitary engineers in this area. I refer to what is popularly called the "Montebello incident" wherein it was necessary to shut down eleven of that city's water wells because of the contamination of their underground waters resulting from the discharge of industrial waste from a single small plant located 15 miles away and engaged in the manufacture of a weed killer. Since that time there has been exceptionally keen interest shown in the industrial waste disposal problem by the sanitary engineers of water supply agencies of this general area.

On April 15, 1946, the Engineer-Director received a letter from Laurance E. Goit, Chief Engineer of Water Works and Deputy General Manager of the Department of Water and Power of this city, discussing at considerable length the serious and increasing effects during the past few years of the discharge of certain types of industrial wastes into storm water channels where they may percolate into the underground water bearing strata and thus affect the quality of the water which is withdrawn by pumping and used within this city or neighboring cities in the Harbor area.

As was to be expected, during the war there had been a great increase in the quantities of industrial wastes discharged into the Los Angeles River and other channels or into storm drains which themselves discharge into channels. There had also been an increase in the quantity of certain metallic and other substances which although eligible for discharge

into storm drains under the limitations set up under the Public Works provisions of the Municipal Code had toxic or other adverse effect when they entered the underground water supplies.

Mr. Goit's letter called attention to the fact that the Public Works provisions were inadequate to meet this threat to the underground water supplies and suggested that Section 38.01 dealing with "Water Courses" in Chapter III, titled "Health and Sanitation," and previously mentioned in this paper, be used. The provisions in this section are exceedingly broad in scope and prohibit "the discharge of any materials or substances of any kind which may in any way be injurious, deleterious or dangerous to the health or well being of human beings or animals, or which may produce unsightly or offensive deposits in or along any such water course or drain or which would be likely to produce or cause nauseous, noxious or dangerous odors or gases to emanate from any such water course or drain."

Cooperative Action

It was agreed that although the enforcement of Section 38.01 is a function of the Health Department, its enforcement was necessarily tied in with Section 64.30, the Public Works section, which we enforce. It was therefore obvious that the welfare of the city required that very close cooperation and unification of effort should exist between the Department of Public Works, the Health Department and the Department of Water and Power. Consequently, there was organized an advisory committee to study the problem in general and to study specific requests for permits as needed, and to advise the Engineer-Director of the Bureau of Maintenance and Sanitation relative thereto so that his report to the Board of Public Works on requests for such permits may include the judgments of the Health Department and the Department of Water and Power. Subsequently a representative of the Bureau of Engineering was also included in the committee. As stated previously, the committee is purely advisory in nature and the Engineer-Director or the Board of Public Works is not bound by its recommendations.

The assistance rendered by the committee has been very helpful. The cooperation between the various agency representatives has been most gratifying. Although there has been some differences of opinion as to the degree of purity to which waste waters must be processed prior to discharge into storm drains or channels to prevent contamination of underground waters, the combined discussion and consideration of these questions results in a clearer understanding of each other's problems and a more complete and balanced understanding of all the factors entering into the approval or disapproval of these permits.

Permits and Inspections

Once a permit is issued, inspections of the installation are made at suitable intervals to see that the installation is properly installed, properly maintained and all permit conditions are being properly observed. Until the last year, except for the relatively short time we had the help of the public works inspectors, only the Industrial Waste Engineer has been available to carry on this inspection program, and since practically all of his time has been required to investigate and prepare reports on new applications, our carefully planned "follow-up" inspection program on existing installations has not received anywhere near the attention it should have. We finally received authorization, however, for six of the ten Industrial Waste Inspectors requested during this fiscal year, and beginning July 1st we had an additional four, making a total of ten inspectors to assist the Industrial Waste Engineer in carrying on this very important work in the field. With this augmented force we believe that a creditable job of inspection and control can be accomplished.

The City of Los Angeles with its 452 square miles of area and with 3,030 miles of sanitary sewers and 717 miles of storm drains does not face an easy task in regulating these matters. We have much hard work ahead of us—we need and invite the cooperation of industry—and in turn will continue to maintain a cooperative attitude in our dealings. Working thus together, our mutual interests will best be protected and served.

Food Plant Wastes

Now a word concerning the city's policy regarding some of the other wastes of industry, not officially or generally known as "industrial waste." Among these other wastes is "Food-plant Waste," which is defined in the Los Angeles Municipal Code as being "all animal and vegetable refuse from commercial establishments resulting from the manufacture of food or drink to be consumed elsewhere than on the premises." This type of waste is similar in most respects to household garbage except for one very important detail and that is that it does not result from the preparation of food or drink to be consumed on the premises. The place at which the food or drink produced is to be consumed, you will note, is the factor which determines whether it is collectible by the city. If the refuse results from the preparation of food or drink in a restaurant, cafe, lunch counter, or similar place where meals are served, the refuse is classed as garbage and will be collected by the city. Otherwise it is classed as food-plant waste and must be disposed of by the company. For this purpose a private collector may be engaged to dispose of this food-plant waste. All persons hauling this type of waste over city streets must first be licensed so to do by the Board of Public Works.

Similarly the city collects noncombustible rubbish only from those places where food is prepared for consumption on the premises.

This policy of not collecting refuse from manufacturing, industrial or commercial establishments, except for those just mentioned, is one of long standing and is based on the fact that such refuse is produced as a result of their carrying on a business for profit and that consequently the cost of disposal of waste incidental to such business is a proper expense of conducting their business and should not be borne by the taxpayers.

The city does not collect any combustible rubbish such as paper, cardboard, cartons, wood, tree and shrubbery trimmings, grass clippings, etc. This material may be disposed of by engaging the services of a licensed private rubbish hauler operating under a permit from the Board of Public Works, who will dispose of such material for a fee from those served. All such material originating in the central portion of the city will be required by ordinance to be taken to the new municipal incinerator now nearing completion at Avenue 21 and Lacy Street.

I have endeavored in the foregoing to give an overall picture of the methods by which wastes from industry may be disposed of in the City of Los Angeles. If our citizens, our industries and our city officials fully realize the necessity of providing satisfactory and sanitary methods of disposing of all types of waste, we shall all benefit by having a cleaner, healthier, and happier city in which to work and live.

THE DETERMINATION OF ZINC IN WATER, SEWAGE AND TRADE WASTES

by B. I. CORSON
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WHILE supervising the operation of a treatment plant where plating department wastes furnished a large proportion of the flow, the author was faced with the problem of devising a speedy routine method for the determination of zinc. The method given in the 9th Edition of "Standard Methods" is too tedious for routine work.

The particular effluent could be sampled where other metals were negligible. It seemed feasible to omit the hydrogen sulfide precipitations and estimate the zinc nephelometrically with ferrocyanide. This did not work out well. The pH must be carefully adjusted to obtain a turbidity which can be accurately compared with standards. This adjustment was too complicated for operators. Besides, they had trouble reading the tubes.

Dithiozone Test Tried

Better success was met with when diphenylthiocarbazone, usually called "dithizone," was tried, using the method of Deckert, as abstracted by Snell. (Snell, Foster D. and Cornelia T., Colorimetric Methods of Analysis, D. Van Nostrand Company, New York). Dithizone forms colored compounds with most heavy metals. It is slightly soluble in water, more soluble in organic solvents. This reagent can be obtained from the Eastman Kodak Co., Rochester, N. Y.

The test was developed and used as a "stop-go" test. A standard containing 3 ppm. was used, because 3 ppm. of zinc was the maximum amount allowed in the effluent. A match, or stronger color than the 3 ppm. standard, was cause for an increase in the chemical feed.

The reagents and modified Deckert technic are given below for both a routine control test and a laboratory method.

Reagents

Dithizone Solution. Shake 0.5 gram of dithizone with 100 ml. of .01N sodium hydroxide solution for 3 minutes. Filter. The solution is the color of methyl orange solution. Use as long as it is clear. It keeps from 2 to 7 days.

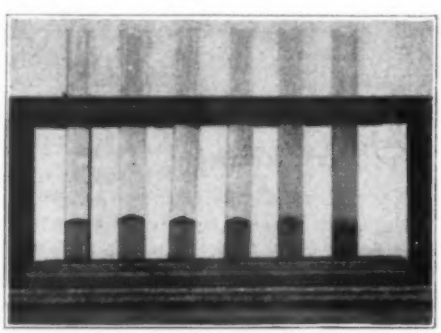
The Author

Zinc-free Water. Shake distilled or tap water with .01 per cent dithizone in carbon tetrachloride. If there is the slightest change in the color of the dithizone solution, repeat the shaking with fresh dithizone. Filter, and store in a bottle kept for zinc-free water only.

Any water which flows through galvanized pipes will give a test for zinc at least occasionally. Distilled water will do so often enough to render purification necessary.

Zinc Standard. Stock solution. Dissolve 0.1 gram of zinc in as little dilute sulfuric acid as possible. When solution is complete, neutralize to methyl orange, then make up to one liter with zinc-free water.

Dilute solution. Make up 3 ml. of stock solution to 100 ml. This contains 3 ppm. of zinc. It should be made fresh every two weeks.



Zinc Standards

The Lower Layer in the Tube on the left is Grass-Green (No Zn); No. 2 is Dove Gray (0.2 ppm. Zn); No. 3 is Purple (0.4 ppm. Zn); No. 4 is blue (0.6 ppm. Zn); No. 5 is Pink (0.8 ppm. Zn) and No. 6 is red (1.0 ppm. Zn.)

Procedure

To each of two matched 100 ml. Nessler tubes add 98 ml. of zinc-free water. To each add 1 ml. of dithizone solution. To one add 1 ml. of sample, to the other 1 ml. of standard. Zinc changes the dull orange color to a bright red. Judge by intensity rather than shade.

A series of standards can be used instead of the "stop-go" standards. If exact results are to be obtained, however, it is better to use the laboratory method given later. This method serves very well for a quick plant test. A test can be finished in 5 minutes. Solutions must be made up every week or oftener. Both copper and cadmium interfere. Precipitated zinc cannot be detected unless dissolved by acid and carefully neutralized. Dark sewages are difficult to match.

While working on a test which would use the more stable carbon tetrachloride solution of dithizone, the author was glad to find the method already worked out in Sandell. (Sandell, E. B., Colorimetric Determination of Traces of Metals, Interscience Publishers, Inc., New York). This method is applicable to wastes with considerable amounts of other metals present. Even copper can be present to twice the amount of zinc. The dithizone solution is bright green when zinc is absent. With increasing amounts of zinc, the color changes to a muddy blue, then purple, violet, reddish violet and finally red.

LABORATORY METHOD USING DITHIZONE

Reagents

Dithizone Solution. Weigh approximately 0.01 gram of dithizone, dissolve and make up to 100 ml. with carbon tetrachloride. This is the 0.01 per cent solution. Dilute 10 ml. to 100 ml. with carbon tetrachloride. This gives a 0.001 per cent solution.

Acetate Buffer. Mix equal volumes of 2N sodium acetate solution and 2N acetic acid solution. Test for pH. It should be very near to 4.75. Adjust if necessary. Place in a separatory funnel and shake with 0.01 per cent dithizone solution for several

minutes. Repeat until .001 per cent dithizone shows no change of color when shaken with the buffer. Filter to remove droplets of tetrachloride.

Sodium Thiosulfate Solution. Dissolve 25 grams of thiosulfate in water and make up to 100 ml. Then free from heavy metals in the same manner as the buffer was purified.

Standard Zinc Solution. To one ml. of conc. hydrochloric acid, diluted with about 10 ml. of zinc-free water, add exactly 0.01 gram of cp. powdered zinc. Make up to 100 ml. when dissolved, using zinc-free water. This solution is 0.01 per cent or 100 ppm. standard. Dilute 10 ml. to 100 ml. This solution is .001 per cent or 10 ppm. standard. The 0.01 per cent solution will keep for a long time, but the 0.001 per cent should be made up fresh at least once a month.

Procedure

Select 6 test tubes of clear white glass, of uniform bore and 20 or 30 ml. capacity. Into one tube pipette one ml. of sample. If the sample contains more than 8 ppm. of zinc, it must be diluted to definite volume and an aliquot taken. To the other tubes add 0.0, 0.2, 0.4, 0.6 and 0.8 ml. of the 0.001 per cent zinc solution, followed by enough zinc-free water to make the total volume of liquid 1 ml. Then add to all tubes 5 ml. of buffer solution, and 1 ml. of thiosulfate solution. Shake each tube. Then add to each tube 5 ml. of 0.001 per cent dithizone solution, shake each tube for two minutes and allow to stand until the liquid has separated into two layers. Compare the lower layer of the sample with the same layer of the standards. It is best to use a white background and a strong light behind the observer. The tubes are viewed sidewise, not endwise. With standards prepared as above, the standards are 0, 2, 4, 6 and 8 ppm. Read the color rather than the intensity.

Because the zinc is extracted from the water layer and read in the tetrachloride layer, dark sewages are as easily analyzed as drinking water. Precipitated zinc compounds, such as hydroxide and sulfide, are dissolved by the buffer solution. If the amount of zinc is less than 1 ppm., use 10 ml. sample, with the tetrachloride and the same amounts of standard solution, but make up to 10 ml. instead of 1 ml. before addition of reagents. The standards are then equivalent to 0.0, 0.2, 0.4, 0.6 and 0.8 ppm.

Instrument Analysis

The electrophotometer or spectrophotometer can be used to advantage. Use small, short-stemmed separatory funnels, separate the carbon tetrachloride layer and make all measurements on this. Use the same amounts of reagents, but extract twice with dithizone and combine extracts before putting them in the cell of the photometer. Either a red or green filter can be used. One measures the red caused by the zinc dithizonate, the other the green of the unchanged dithizone. Since the filters supplied with different makes of photometers vary in wave length transmitted the analyst should try out both colors when making his standard curve.

The filter photometer measures the intensity of a color. A filter which

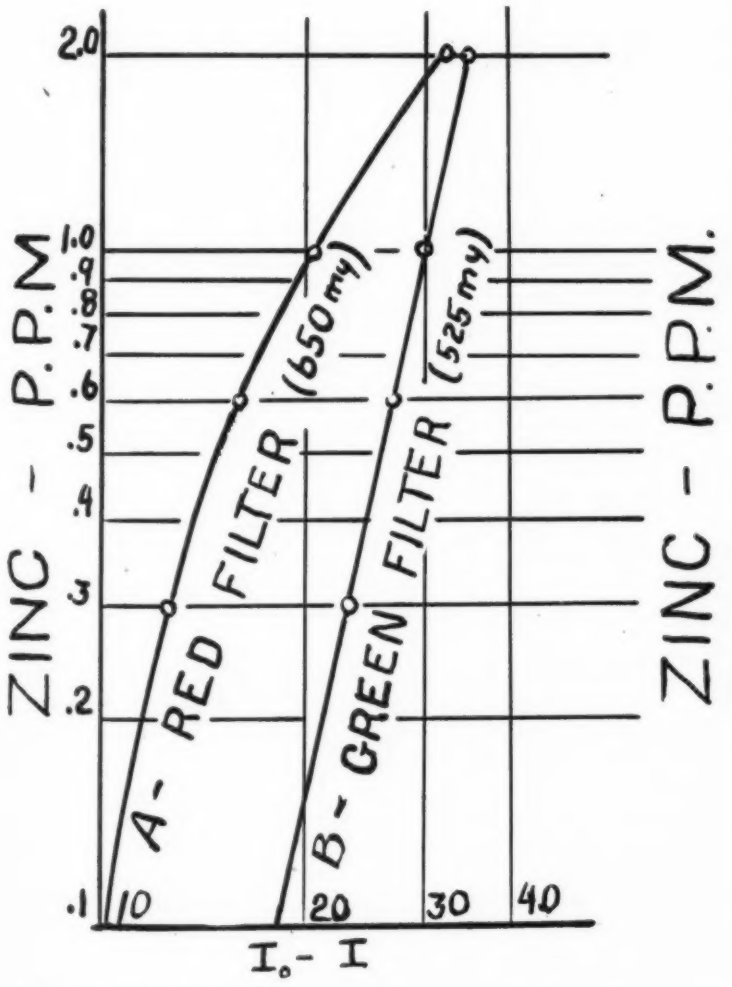


Fig. 1—With Proper Filter, the Photometer Readings of Standard Solutions Plot to Straight-Lines on Log-Log Paper, Like Curve B.

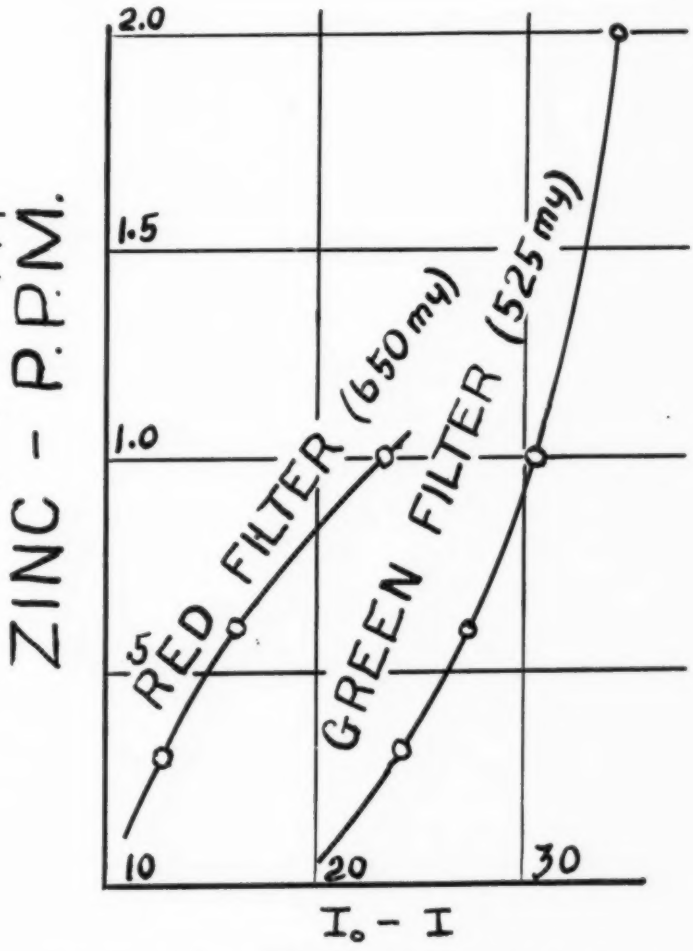


Fig. 2—The Same Photometer Readings of Standard Solutions Plot as Curves on Ordinary Cross Section Paper.

cuts out all but the wavelength to be measured must be used. Graph 1 shows that the green filter will give the best results, because it plots to a straight line on log-log paper.

The color change with zinc dithizonate is from grass-green to bright red. Either the fading of the green or the increase in the red can be measured.

The second graph is the same data on ordinary cross-section paper. After such a graph is prepared, any sample is analyzed by shaking the sample with the carbon tetrachloride solution of the reagent and measuring the color intensity. A similar test is made with zinc-free water. It is the difference in these readings that is read off the graph to find the ppm. of zinc.

The photograph shows standards when the photometer is not used. Only a color photograph could show the standards exactly as they look.

THE WEATHER IN PROSPECT

by HALBERT P. GILLETTE*
SAN MARINO, CALIF.

THERE are numerous weather cycles whose lengths are less than 67 years, as indicated by the accompanying table. Partly because of their large number, but also because of other factors, in regions subject to great changes, it is not yet possible to forecast reliably as to weather a week or so ahead. But this does not mean that the forecaster is helpless where the longer cycles are involved.

To begin with there are, I believe, few important weather cycles of less than 67 years other than those in the accompanying table; but at times weather cycles of half these tabular lengths occur.

The first law of cycles is that the vast majority have lengths that form geometrical progression series whose ratio is three.

The second law is that cycles whose lengths are commensurable are harmonic.

What the second law says is that the peak and valley of a long cycle in a given triplex series is also the peak and valley of every shorter cycle in the same series. Thus the 67-year and the two 48-year cycles of Series A had a simultaneous rainfall maximum July 12, 1883, in regions where the opposite (a drought) did not occur. Hence on July 12, 1950, a rainfall peak will occur again in many regions, and 2.48 years (practically 30 months) earlier there will be wet-cold weather, namely in January 1948, unless offset by some other cycle. Since no other cycle in the table will offset this effect, it is highly probable that January 1948 will be abnormally snowy in northern regions.

The third law is that the amplitude of a short subcycle in a given series increases when its peak occurs near that of a long supercycle of that series.

This law makes it probable that January will be extremely snowy.

The fourth law is that exactly opposite conditions may occur in localities not far apart, when storm tracks are narrow and tend to repetition along a given track.

In consequence, what one locality gains in precipitation is at the expense of other localities. This condition is still very difficult to forecast and tends to upset any forecast as to rainfall and snow in a particular locality. But when the forecast relates to a region (e.g., Illinois) there is less risk of failure in forecasting, because storm tracks usually tend to shift frequently and considerably. This is notably true in connection with winter storms.

There are other causes of opposite phases of weather in different regions; e.g., due to the existence of some intense stationary anticyclone, or high barometric pressure area, that covers a large region. When thus blanketed by descending dry air, such a region has a prolonged drought near the rainfall peak of a long cycle in another region controlled by a great stationary cyclone. Of course this is contingent on there being no long cycle that has a valley about the same time. Blanketing with dry air is apt to exist in the summer in certain parts of temperate zones. Hence it often happens that a summer drought in such a region is followed by a very wet winter. Like opposition between summer and winter rainfall, there tends to exist opposition between fall and spring rainfall.

The fifth law is that the greater the length between similar phases of a cycle (i.e., the lengths given in the table), the longer do its very wet and very dry periods last.

According to the fifth law, either very rainy or very dry weather tends to exist on the average for about 6 years before and 6 years after a peak of the 67-year cycle. But since that cycle has subcycles, they cause oscillations in the rainfall that tend to be more extreme as the peak of the cycle approaches.

Ed. Note: A booklet on *"Cycles and Their Causes"* will be printed in January, a copy of which will be sent gratis to readers of *Water & Sewage Works* on request. Address Gillette Pub. Co., 22 West Maple St., Chicago 10, Ill.

SIX TRIPLEX SERIES OF CYCLES

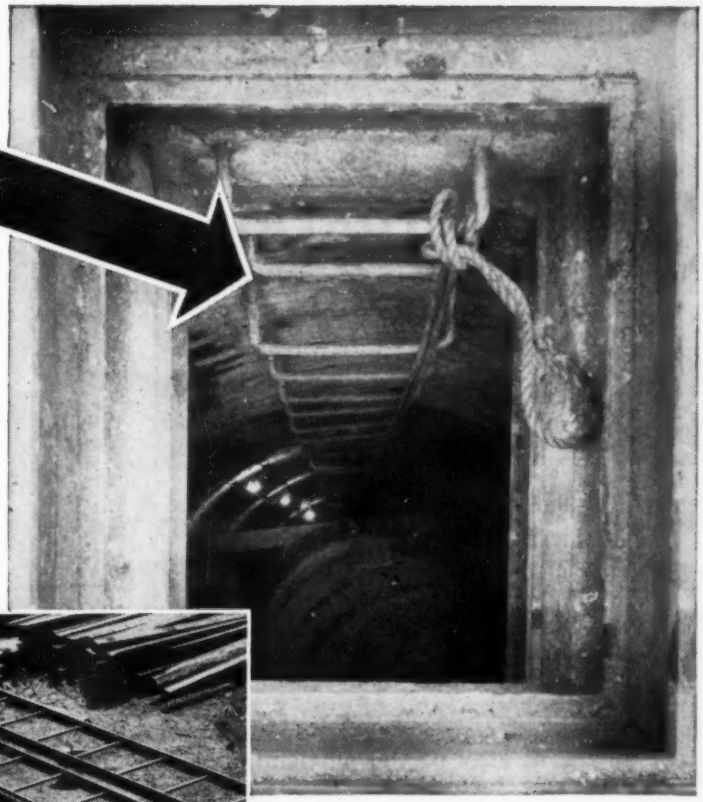
Series	Lengths of Cycles in Years						Peak July 12
A	67.00	22.33	7.44	2.48	0.83	0.27	1883
B	63.00	21.00	7.00	2.33	0.78	0.26	1872
C	59.00	19.67	6.56	2.19	0.73	0.24	1876
D	55 00	18.33	6.11	2.04	0.68	0.23	1881
E	51.00	17.00	5.67	1.89	0.63	0.21	1871
F	47.00	15.67	5.22	1.74	0.58	0.19	1902

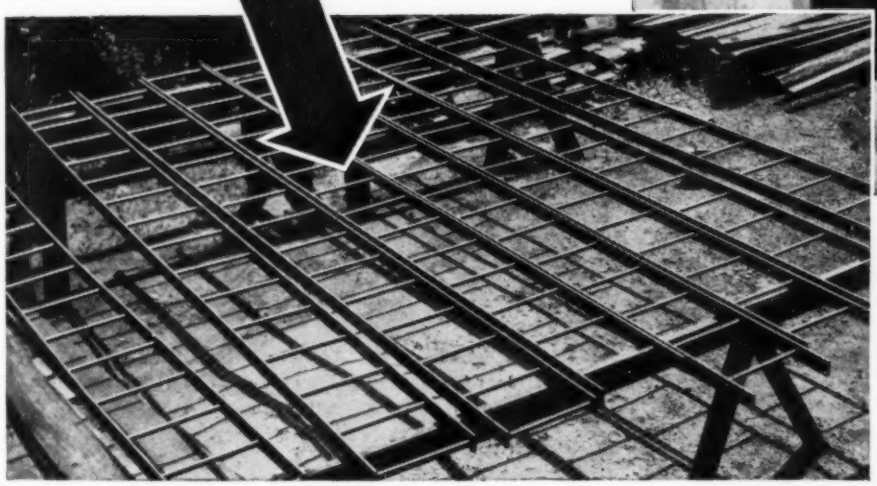
Footnote: The length of each cycle in each of these 6 triplex series is exactly three times that of the next shorter one. Cycles of half these lengths exist in sunspot numbers, and sometimes in rainfall, but in rainfall the tabular lengths are more common. Cycles whose lengths are given in the same column differ in amplitude (departure from a mean), those of Series A having the greatest amplitude. The lengths of cycles in each column are an arithmetical progression series.

*President, Gillette Publishing Co.

WATER & SEWAGE WORKS, January, 1948

These old Wrought Iron Rungs served 50 years SO These new Ladders are BYERS WROUGHT IRON





BYERS WROUGHT IRON
excels in these water works
and sewerage applications, too:
DIGESTOR COILS VENT STACKS
ROTARY DISTRIBUTOR ARMS
WEIR PLATES OUTFALL LINES
TRASH RACKS AND SCREENS
SLUDGE GAS LINES
COMPRESSED AIR LINES

When the Cleveland (O.) Water Department decided to replace some old ladders in their tunnel shafts, the records of the original wrought iron rungs provided a splendid guide in selecting the new material. The old rungs illustrated were installed in a 85-foot shaft, and had served for over 50 years. Primary reason for replacement was uneven spacing, which made for a dangerous condition; except for a few bottom members, the rungs were still in splendid condition. New ladders were fabricated from Byers Wrought Iron by Patterson-Leitch.

PROVEN ENDURANCE

Manhole ladder steps are one of the many applications in the waterworks and sanitary fields where wrought iron has proven its superior durability and over-all economy. Communities in all sections of the country have standardized on this reliable material, thereby reducing replacements, and eliminating a serious safety-hazard. Damp, humid atmospheres found in tunnels are death to ordinary metals . . . but meet their match in wrought iron.

THE WHY OF DURABILITY

Wrought iron's superior endurance comes from its unique composition and structure. Tiny fibers of glass-like silicate slag, threaded through the body of high purity iron, halt and "detour" corrosive attack, discouraging local pitting. The fibers also help anchor the initial protective scale, which shields the underlying metal.

SEND FOR BULLETIN

Our bulletin, "Wrought Iron for Sewage Treatment and Disposal Installations", gives helpful information on the current use and record of wrought iron manhole ladder steps. A complimentary copy will be sent on request.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N.Y.

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GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
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WORK-SAVER PIPE TOOLS
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MEETINGS SCHEDULED

JAN. 20, 1948—NEW YORK, N. Y.—(Commodore Hotel)

New York Section A.W.W.A. (Winter Luncheon Meeting 1:00 P.M.) Sec'y-Treas., R. K. Blanchard, 50 West 50th St., New York, N. Y.

JAN. 21-24—NEW YORK, N. Y. (Commodore Hotel)

American Society of Civil Engineers. Secretary, Col. Wm. Carey, 33 West 39th St., New York, N. Y. (Sanitary Engineering Division—Thursday, Jan. 22, A.M. & P.M.)

JAN. 23-24—NEW YORK, N. Y. (Pennsylvania Hotel)

New York State Sewage Works Association. Secretary, A. F. Dappert, State Dept. of Health, Albany, N. Y.

FEB. 8-12—COLLEGE STATION, TEX.

Texas Water Works & Sewerage Short School. Sec'y-Treas., V. M. Ehlers, 410 E. Fifth Street, Austin 2, Texas.

FEB. 11—PORTLAND, ME.

Maine Water Utilities Association. Sec'y, Earle A. Tarr, Water District, Winthrop, Me.

MARCH 11-13—NEW ORLEANS, LA. (Hotel Roosevelt)

American Concrete Pipe Association. (40th Annual Meeting.) Director, Howard F. Peckworth, American Concrete Pipe Association, 228 N. LaSalle Street, Chicago, Ill.

APR. 1-2—SYRACUSE, N. Y.—(Hotel Syracuse)

New York Section A.W.W.A. (Spring Meeting). Sec'y-Treas., R. K. Blanchard, 50 West 50th St., New York, N. Y.

APR. 5-8—ST. LOUIS, MO.—(Jefferson Hotel)

National Association of Corrosion Engineers. Exec.-Sec'y., A. B. Campbell, Southern Standard Building, Houston, Texas.

APR. 8—LIVINGSTON, MONT. (City Auditorium)

Montana Sewage Works Association. Sec'y-Treas., H. B. Foote, State Department of Health, Helena, Mont.

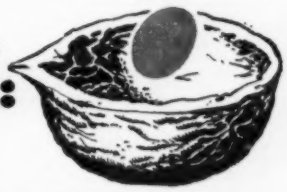
APR. 21-23—WEST LAFAYETTE, IND. (Purdue Union Building)

Indiana Section A.W.W.A. Sec'y, Charles H. Bechert, 140 N. Senate Ave., Indianapolis, Ind.

MAY 3-7—ATLANTIC CITY, N. J. (Convention Hall)
American Water Works Association (Annual Meeting). Hotels—Ambassador, Chelsea and Ritz Carlton. Exec.-Sec'y, Harry E. Jordan, 500 Fifth Ave., New York, N. Y.

WHY METER SEWAGE?

IN A NUTSHELL, HERE'S THE ANSWER:*



METERING ***INDICATES THE PRESENCE OF UNUSUAL QUANTITIES OF SURFACE OR GROUND WATER.***

METERING ***FURNISHES INFORMATION ON WHICH TO ESTIMATE FUTURE FLOWS AND THE NEED FOR ADDITIONAL TREATING FACILITIES.***

- Sewage flow per capita daily
- Detention period in tanks
- Total solids handled
- Sludge per million gallons of sewage
- Cost of pumping sewage per million foot-gallons and treatment per million gallons
- Sewage treated per unit area — by trickling filters, contact beds, intermittent sand filters, sedimentation tanks, etc.
- Organic load, hourly and daily, on sewage plant and the water receiving effluent

METERING ***INDICATES OPERATING PROCEDURE.***

- Need for by-passing sewage
- Quantity of chemicals for coagulating purposes
- Quantity of chlorine or hypochlorite of lime required
- Quantity of activated sludge to return to aeration tanks
- Quantity of air for grease removal and activated sludge process
- Number of pumps and treatment units to operate

* * *

Throughout the country, sewage treatment plants, large and small, depend on Builders Meters for accurate metering.

For bulletins, address Builders-Providence, Inc., (Division of Builders Iron Foundry), 10 Codding Street, Providence 1, R. I.

*Based on "Sewage Treatment Works" by C. E. Keefer.

BUILDERS PRODUCTS

Venturi, Propeloflo and Orifice Meters • Type M and Flo-Watch Instruments Venturi Filter and Wash Water Controllers and Gauges • Master Controllers • Kennison Nozzles Chronoflo Telemeters Conveyoflo Meters Wheeler Filter Bottoms Filter Operating Tables.

BUILDERS PROVIDENCE *Instruments*

NOW... QUALITY WATER

AT LOW TEMPERATURES

During winter months also, you can produce better quality water when you coagulate with an N-Sol Process. With the N-Sol Silicate processes of coagulation, the floc is large, tough, and rapid-settling, regardless of temperature.

Measurable results are lower turbidity, longer filter runs, increased plant capacity.

Before you complete plans for a new filtration plant, know more about the N-Sol Process for summer or winter coagulation. Complete information is available for the asking.

These processes fit any coagulating procedure — save space, save money.

N-Sol-A° — N Brand reacted with ammonium sulfate. Used where chloramine sterilization is desired.

N-Sol-B — N Brand reacted with alum. Used with any sterilization procedure. (U. S. Pat. 2,310,009)

Baylis Sol — N Brand reacted with sulphuric acid. Used with any sterilization procedure. (U. S. Pat. No. 2,217,466)

°Pat. Applied For

N-SOL PROCESSES FOR WATER COAGULATION

Developed and Patented by

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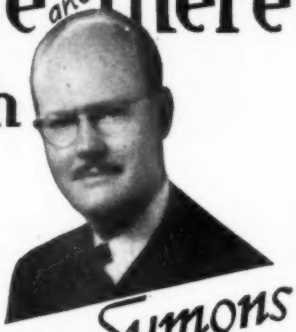
Available under license without charge • Philadelphia 6

Here and There with Doc Symons



H.T.M.A.—And once again because of the printing situation in Chicago, I shall delay my annual review until the February issue as I did last year.—And now that you know what H.T.M.A. means, let's toss off a couple of predictions.

* * *

First, I predict that **W. & S. W.** will come up with a couple of new ideas or changes, just as we did last year. We might even come out on time with five issues instead of four as was our record in 1947.

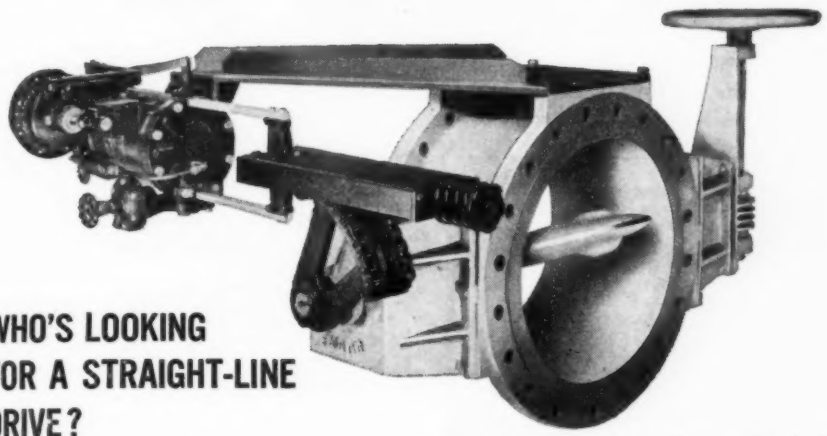
Secondly, I predict that if some A.W.W.A. program chairman is smart, he'll scoop the country with a speaker on the possible effect of artificially produced rain on the water supply industry. And that story will include not only the dry-ice and silver iodide methods for producing precipitation, but also the new method by which ordinary water is dispersed in small quantities in actively growing cumulus clouds. That story might well include a consideration of the legal angles to this matter of borrowing some one else's rain water.

Thirdly, I predict that some smart program chairman in a sewage works association will scoop the field by obtaining a speaker to discuss a new type of industrial waste, namely, radio-active waste from atomic ovens. Soon these wastes will be too dangerous to discharge into the air as is now done in some cases. These wastes cannot be buried in the ground or thrown in the sea as they might escape later to affect fish and plant life. If buried in caves, such wastes might reach underground water supplies, and if these wastes ever reach a water supply, you can just plan on shutting up your city and moving away.

* * *

R-S valvEvents

ISSUED PERIODICALLY BY R-S PRODUCTS CORPORATION, PHILADELPHIA 44, PA., FOR THOSE CONCERNED WITH FLOW CONTROL AND SHUT-OFF



WHO'S LOOKING FOR A STRAIGHT-LINE DRIVE?

Constant 90° angularity between the prime mover and the valve stem . . .

Since 1943 the R-S Type 602 valve has had great success in the service of our customers who want Straight-line drive.

The picture shows a 24-inch 150-pound R-S Cast Steel valve with Series 15 raised face flanges and air-cylinder positioner. Hydraulic cylinders and air diaphragm motors, with or without positioners, are also available. They operate through a chain and sprocket providing straight-line action and eliminating compensation for angularity of bell-crank arm.

The valve pictured is provided with dual stuffing-boxes which cause the vane to "float" regardless of working pressure in the line. The handwheel and de-clutching unit for manual control are mounted opposite to the mechanical control side of the valve.

These R-S valves are available in all sizes for many temperature and pressure ranges.

R-S Appoints New Representatives

Latest appointments to the growing list of R-S Valve Representatives are:

Los Angeles: W. J. Beckett, 108 West Sixth Street, Los Angeles 14, handling Southern California. Phone Vandyke 2914.

San Francisco: Merrill Company, 502 Market Street, San Francisco, handling Northern California. Wm. H. Edis is in charge of the Merrill organization. Phone Sutter 1-8280.

Knoxville: L. W. Oakley Sales Engineers, 408 West Church Avenue, Knoxville 10, Tennessee. The Oakley organization covers Tennessee, with offices also in Chattanooga and Johnson City.

Birmingham: Harry G. Mouat, 544 American Life Building, Birmingham 3, Alabama; covering Alabama and West Florida.

Santiago: Garrido, Garcia Burr & Co., Calle Central 40, Santiago, Chile.

R-S ESTABLISHES NEW ELECTRONIC DIVISION

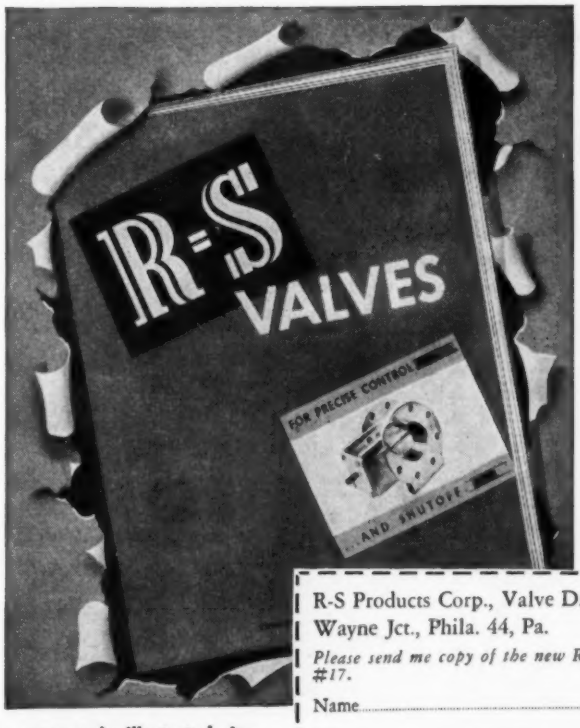
To thoroughly inform its Valve Division representatives, who will handle the line, on the products and developments of its newly established Electronic Division, R-S Products Corporation recently called two special conferences. A Western group met at Chicago and the Eastern group at the company's plant in Philadelphia.

The Electronic Division is under the direction of David W. Hopkins, Executive Vice President of the company, and under the immediate management of Donald C. Culver, Ch.E. Culver, a graduate of Lehigh University, is an experienced physicist in the instrument and electronic field.

A new product of the Electronic Division is a unit for the control of fluid level, pressure and temperature, (R-S Catalog No. 27) called the Leveltronic, or Level Control.

JMLco P-AA2

Send for YOUR copy of the NEW R-S Valve Catalog No. 17!



Fully descriptive, generously illustrated; includes *complete* dimensional data on *all* R-S Valves. Write, wire, or phone: R-S PRODUCTS CORPORATION, Wayne Jct., Phila. 44, Pa.

R-S Products Corp., Valve Division
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Please send me copy of the new R-S Valve Catalog #17.

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City..... State.....

Have you ever wondered how a man looks while he is waiting to receive some honor from the hands of an A.W.W.A. president. Gaze then at the above strip and see left to right: **Louis R. Howson,** Cons. Engineer, Chicago (Goodell Prize); **E. L. Filby,** Cons. Engr., Kansas City (Diven Medal); **Shep. T. Powell,** Cons. Chem. Engr., Baltimore (Fuller Award); and **Cliff H. Fore,** Supt. of Water, Robinson, Ill. (Fuller Award).

Of course, you know that these were taken at San Francisco last July and that the man to whom they were all looking was Wendell La Due.

* * *

It seems that working in the Los Angeles Water Dept. (that's Sam Morris' department, y'know) is good training to become a writer. Take the case, for instance, of John L. Welsh (Tabulating) who had an article in *Esquire* on how to play a tricky variation of the well-known tick-tack-toe. Seems he invented the new game.

And then there's the story of a new musical due in New York some time in the future. The show, "Queen of the West" is from an original story by Robert Speers and Bert Holloway, both of whom once worked for the Los Angeles Water Dept. They found the story in the company records. It tells of the building of the first aqueduct which turned L.A. from a desert into a potential metropolis. That's one show I want to see.

* * *

Hoosier Hot Shots

I promised John Kleinhenz (Public Relations Director, Indianapolis Water Co.) that I would furnish him with photographic proof that the boys from Indianapolis actually attended the A.W.W.A. Convention in S.F. Naturally John knows who these Hoosier Hot Shots are, but for those of you who don't, cast

The

FORD COPPERHORN

SLASHES TIME ON VERTICAL METER SETTINGS

The Ford Copperhorn provides the ideal setting for a meter on vertical piping. Installation requires but one or two cuts and threads and eliminates the many pipe fittings usually required to set the meter upright.

Not only does it slash labor and time, but it actually cuts the pressure loss to less than half of what it would be through the fittings it replaces. Oversize copper tubing and wide, sweeping curves offer practically no resistance to the flow of water.

Best of all, the setting is permanently aligned for fast meter changes. Construction is entirely of copper and bronze. No electrical bonding required around meter.

For further information, send for new Ford Catalog No. 46.

THE FORD METER BOX COMPANY, INC.

FOR BETTER WATER SERVICES — FORD

Wabash, Indiana

Dependable!
Rugged!

VALVES
HYDRANTS

M & H Flap Valve

VALVES: A.W.W.A. type iron body, bronze mounted with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square bottom type operates in any position. All rugged and dependable, made of best material with highest quality workmanship. *Hydraulically Operated:* For remote control of operation and for quicker, easier opening or closing. Can be supplied in any of the standard sizes of M & H A.W.W.A. gate valves, either high or low pressure.

HYDRANTS: Standard A.W.W.A. type approved by Underwriters and Factory Mutuals. Dry top, revolving head, easy to lubricate. High efficiency because barrel diameter not reduced and there are no working parts or obstructions in waterway. SPECIAL TRAFFIC MODEL is designed to yield at ground line under impact, repair being simply renewal of breakable bolts and breakable coupling on stem.

M & H Shear Gate

Write for Catalog No. 34

M & H PRODUCTS INCLUDE

FIRE HYDRANTS	SHEAR GATES
GATE VALVES	MUD VALVES
TAPPING VALVES	VALVE BOXES
WALL CASTINGS	FLAP VALVES
SPECIAL CASTINGS	SLUDGE SHOES
TAPPING SLEEVES	FLANGE AND FLARE FITTINGS
CHECK VALVES	FLANGED FITTINGS
FLOOR STANDS	B & S FITTINGS
EXTENSION STEMS	CUTTING-IN TEES

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

+ Plus Chlorine
— Minus Taste and Odor

PUT chlorine in to take taste and odor out. Chlorine, the standard treatment for water sterilization, is giving plus value to water supply by its ability to remove objectionable tastes and odors.

Superchlorination with later dechlorination... chlorine in conjunction with ammonia to form chloramine... continuous chlorination of entering water. These are some of the ways chlorine is being used to eliminate tastes and odors depending upon their cause.

There may be a choice about the method that will give you best results, but for the chlorine to use, there is no question. Hooker has been providing high quality, high purity liquid chlorine to water works, filtration plants and sewage systems for many years. Hooker's technical staff, continuously working with chlorine, has accumulated a fund of specialized knowledge that is available to you for help in overcoming and solving problems in handling chlorine. Call on them whenever you need information or assistance.

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ELECTROCHEMICAL
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CHEMICALS

Chlorine Caustic Soda 8512

your optics on: C. K. Calvert, Supt. of Purif., L. S. Finch, Chief Engr., and H. W. Niemeyer, Supt. of Distrib., all of the Indianapolis Water Co., and C. H. Bechert, Dir., Div. Water Resources, Indiana Dept. of Conservation, Indianapolis. — Yeh John! Cecil, Lou, Nemo, and Charlie were all there.

* * *

You may think that all of the stories about Mike Glace's bridge playing are kidding. Well, this actually happened on the train coming back from San Francisco last July. A stranger, and a lady at that, was watching a number of Pee Bees play bridge one night. One of the Pee Bees was Mike Glace, and it was to him she spoke, saying, "You play bridge like I do."

Mike looked up and asked, "How's That?"—"Not very well," was her rejoinder as she moved away.

* * *

Out at State College, Penna., last August at the Penna. Sew. and Ind. Wastes Assn. meeting, N. S. (Joe) Chamberlin, San. Chem. of W. & T., explained a new method of controlling sewage chlorination. Joe knows a fellow who watches the silver fillings in his teeth and when they turn black from the H_2S in the air he knows it is time to increase the chlorine dose.

* * *

! Prestidigitator !

Hokus-Pokus, Dominokus, Chicken Bones Choke us and Sludge Shovelers Society.—Well, what d'y'know — Lloyd Nelson, (Eastern Mgr. of U. S. Pipe, Philadelphia) really can do magic tricks, even if he can't get you that C. I. pipe you want.

* * *

There's always room for one more.—The elevator had eight or nine passengers aboard, and there were more waiting in the lobby. (It was at the N. Y. Section Meeting at the Hotel Champlain, Plattsburgh, N. Y., last September).—With a cheery smile, the pretty elevator operator called out, "There's always room for one more."—You should have seen the look that crossed her face when "Huge" Dewey stepped up and said, "O. K., Girlie, Let's Go."

Yes "Huge" Hugh Dewey is the biggest man in the water works business—Weight 325 lb. (he says) —Could be more. Height well over six feet. Occupation—President of Western New York Water Co. which supplies the suburbs of Buffalo, N. Y. Hugh is a past chairman and past director of the N. Y. Section. Great Guy—Big, Too! Why "Huge" is so big that when he stepped on one of those penny scales that prints your weight and your fortune on a little card, the card came out saying, "One at a time, Bud." (I'll go quietly).

* * *

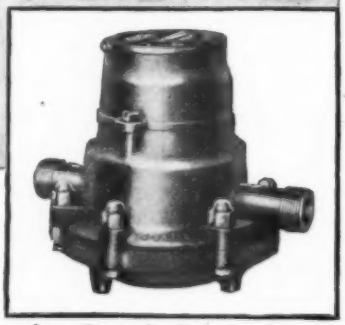
Freezing weather! Inadequate heating! These factors need not load up your meter shop with repair jobs. The frost bottom in American or Niagara water meters patented in 1921 and improved in 1938 prevents costly damage.

When ice forms in the meter and expansion takes place, the low cost bottom casting breaks, relieves pressure and allows all working parts including the gears to move with the ice. Damage is limited to the frost bottom. By replacing the bottom, on the spot, the meter is again ready for service.

The breaking point is carefully controlled and checked in advance by pressure tests at the factory.

The advantages of frost bottom meters are available to you at no extra cost.

Write for the full story on these meters that have become standard in many communities where temperatures drop below freezing.



AMERICAN BRONZE CASE NIAGARA GALV. IRON CASE

WATER METERS

BUFFALO METER COMPANY

2909 MAIN STREET • BUFFALO 14, NEW YORK

LUMETRON

Photoelectric Colorimeter Model 450 for Nessler Tubes

A new photoelectric instrument of high accuracy for the measurement of color and turbidity, as well as for all analytical colorimetric tests in the examination of water and sewage.

- Turbidity tests in terms of APHA (ppm) scale.
- Color tests in terms of APHA (mg Pt) scale.
- Suited for determination of ammonia nitrogen, nitrate, nitrite, and for all other colorimetric tests according to APHA "Standard Methods."
- Operates with all "low form" Nessler tubes 32 mm O.D., 200 mm high. Requires no matched sets of tubes.

LUMETRON Mod. 450 eliminates the uncertainties of visual matching methods. It requires no permanent color standards and furnishes reproducible results independent of individual judgment and of light conditions.

Write for literature to

PHOTOVOLT CORP.

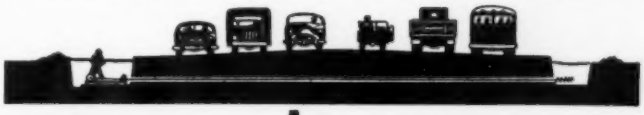
95 Madison Ave. New York 16, N. Y.

Write also for literature on

PHOTOVOLT Line-Operated pH METER

PRICELESS!...

200 Feet of 14½ Dia. BORED HOLE



Fast 5 Horsepower

MODEL 10-A

newest and largest

HYDRAUGER

Frequently a HYDRAUGER saves its entire cost on a single job; but what is still more important, most of the hundreds of HYDRAUGERS now in use have paid for themselves within a year on just ordinary day-to-day pipe installation jobs... there's *always something* for a HYDRAUGER to do—ORDER YOURS SOON!

Bores 2½". Reams to 4½", 6½", 8½", 10½", 12½", 14½".

OPERATES ON 90 LBS. AIR PRESSURE

HYDRAUGER*

*Reg. U. S. Pat. Off.

EARTH BORING TOOL

Write for

CATALOG TODAY

HYDRAUGER CORPORATION, LTD.

116 New Montgomery St., San Francisco, Calif.

5 GOOD REASONS

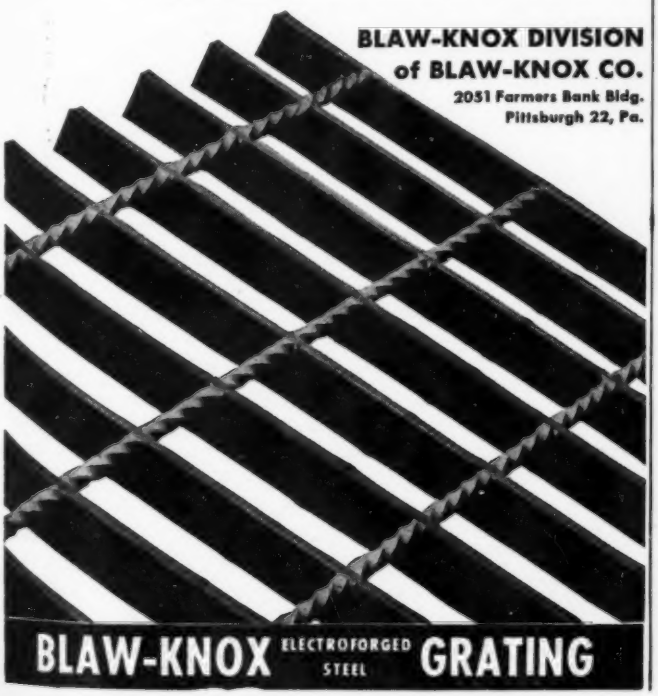
for buying Blaw-Knox Grating

... COUNT 'EM!

1. STRONG electroforged construction for easy erection.
2. MAXIMUM OPEN AREA for light and air.
3. EASY TO MAINTAIN... paint reaches entire surface.
4. SELF-CLEANING, no sharp corners to clog.
5. SAFE footing at all times with twisted cross bar.

BLAW-KNOX DIVISION of BLAW-KNOX CO.

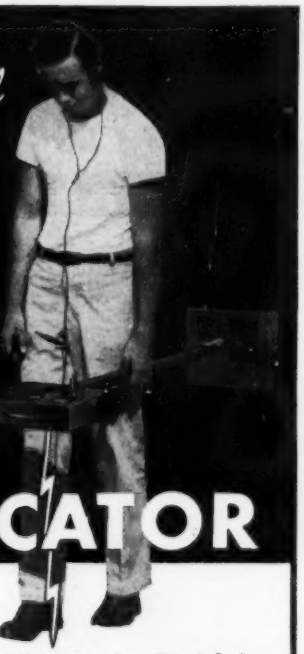
2051 Farmers Bank Bldg.
Pittsburgh 22, Pa.



BLAW-KNOX ELECTROFORGED STEEL **GRATING**

The Sensational New

FEATHERWEIGHT



MODEL 87

GOLDAK

PIPE LOCATOR

Goldak Invites Comparison

- Shows - not approximate but *EXACT* location of buried pipes, mains, services, gates, tees, ells, stubs, etc.
- Featherweight - only 11 lbs. complete.
- No trick tubes or other hard-to-get parts. Uses readily available standard miniature radio tubes and flashlight batteries.
- Compact in design, ruggedly built for lifetime use.
- Operating simplicity. A one-man instrument.
- Guaranteed superior performance - resulting from 15 years of electronic research and construction of locating instruments.

GOLDAK OUTSELLS - BECAUSE IT EXCELS

WRITE FOR DETAILS

THE GOLDAK COMPANY

1544 West Glenoaks Blvd., Glendale 1 California

Guess I never told you that George A. Mizelle, Maintenance Engineer of the City of Norfolk, Va., is quite a Skeet Shooter. In the North-South Championship Shoot at the National Capital Skeet Club in Wash., D. C., last May, George broke 98 x 100 in competition, thereby winning the 20-gauge contest. Was runner up in the two-man 12-gauge event. Whereupon, Fred (Automatic Sampler) Stuart dubbed Mizelle, "Water Works Straight Shooter" — (Never knew a water works man who wasn't.)

* * *

Last summer I was surprised and pleased when one of my readers from Santiago, Chile, dropped into the office to say hello. T. N. Chambers was the man. "T. N." heads his own company down there and constructs filter plants, swimming pools and such. How are things down your way this season, T. N.?

* * *

My apologies to Casey (Complex Walve and Spigot Co.) Jones of the Society of Council Bluffers. In the report on the election of officers of the W.S.W.M.A., we failed to mention that Simplex Valve and Meter Co. is a member of the Bd. of Directors of W.S.W.M.A.

* * *

This IS Inflation!

We've been hearing Fritz Friel (Cons. Engr. of Philly) tell about how construction prices have soared. Now comes Linn Enslow with this proof positive from the *Investor's Reader*.—And no vent stack either.

* * *

Down Washington way at the 4-States meeting, I learned that Mary Lib (one b) Brumley's grandmother is 90 years old and still president of the Knox Gelatin Co.—When Mary Lib becomes president of the company she's promised me the job of public relations director. Right now Mary Lib is busy being Mrs. Al. Brumley of the Electronic Coagulator Brumley's of Baltimore.

* * *

Do you know the Maxwell Twins?

* * *

Didn't have time to tell you last month that in November the Westchester Co. Chapt. of the N. Y. State Prof. Engrs. Soc. tendered a testimonial dinner to Jim Harding, our county Public Works Commissioner. More than 600 attended. Gave him a beautiful Magnovox console radio.—It couldn't have happened to a nicer guy!

* * *

At the 4-States Section Dinner, I had the pleasure of being a guest at the table celebrating the ninth wedding anniversary of the Dick (Gen. Chem.) Ockershausens. Others present besides Dick and Hertha were Larry and Mel McClung of the Washington Dalecarlia Filter Plant and Ralph and Jo Fuhrman of the Washington Blue Plains Sewage Works.

IF IT'S *CLOGGED*
WE CAN CLEAN IT

In the course of cleaning close to forty million feet of pipe over a period of more than forty years, the National Water Main Cleaning Co. had developed highly specialized methods and equipment for removing practically any type of pipe accumulation or obstruction quickly, economically and thoroughly.

National Know How Pays.

NATIONAL WATER MAIN CLEANING COMPANY

50 CHURCH STREET, NEW YORK 7, N. Y.

ATLANTA.....1221 Mortgage Guarantee Building	RICHMOND.....210 East Franklin Street
BOSTON.....115 Peterboro Street	ST. LOUIS.....7103 Dale Avenue
CHICAGO.....205 West Wacker Drive	SALT LAKE CITY...149-151 W. Second South Street
HOUSTON.....2518 Grant Street	SAN FRANCISCO.....681 Market Street
KANSAS CITY.....421 B.M.A. Building	MONTREAL.....2028 Union Avenue
LOS ANGELES.....448 South Hill Street	VANCOUVER, B. C.....105 W. 1st Street
MEMPHIS.....822 Dermon Building	WACO.....P. O. Box 887
OMAHA.....3812 Castellar Street	WINNIPEG.....576 Wall Street

HAVANA • MAYAGUEZ, PUERTO RICO • BOGOTA • CARACAS • MEXICO CITY

Mrs. Ockershausen told me a wonderful story about Dick, but for the life of me, I can't remember it. Guess I was completely overcome with all that feminine pulchritude surrounding me.—And where *have* you been all of these years, Mietz?

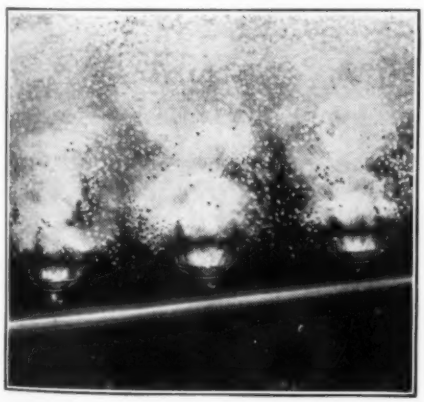
* * *

Just to start the new year out right let's all pronounce my name correctly. Of course, you don't have any trouble with "Doc," but Symons is pronounced with a long y as in eye as Sī'-munz. — Thanks Folks. V.T.Y.—Doc.

MANUFACTURERS' and EQUIPMENT NEWS

100
Impingement Aerator

The impingement aerator known as the Diffusair is a unit developed by Walker Process Equipment, Inc., of Aurora, Ill., for the purpose of dividing diffused air or gas into small bubbles to agitate and oxygenate aeration tank liquors.



The principle involved is that of combining a low velocity jet of water and large air bubbles within an open cup-like impinger. The cavitation effect produced divides the air into extremely small bubbles. The amount and pressure of the impingement water is low and the power energy expended is insignificant.

The impinger unit is capable of diffusing from 1 to 18 cfm. of air without any change in pressure or

Blower questions answered
Centrifugal Blower of 19,150 CFM capacity, driven by 200 HP steam turbine.
Rotary Positive Blower of 12,500 CFM capacity, with direct-connected motor drive.

by R-C dual-ability

When you put your blower questions up to Roots-Connersville, you gain these important advantages:

1. Long experience in the adaptation of blowers to needs of sewage plants and waterworks, coupled with the forward-thinking of our alert engineers.
2. Our *dual-ability* to supply either Rotary Positive or Centrifugal Blowers, whichever type is best fitted to the specific work.
3. A wide range of standard capacities, from 5 CFM to 50,000 CFM (or higher), adapted to any modern drive, which makes for lower prices and faster deliveries than "special" designs.

Finally, when you have selected the R-C Blower that satisfies your requirements, you can be certain of sound, sturdy construction, low maintenance and operating costs, and a long life of profitable performance. For accurate answers to your blower questions, consult us.

In 1858, when the Atlantic Cable carried its first message, "Roots" had been building blowers for four years, since 1854. We're not good because we're old, but old because we're good.

ROOTS-CONNERSVILLE BLOWER CORPORATION
801 Mount Ave., Connersville, Ind.

ROOTS-CONNERSVILLE ROTARY CENTRIFUGAL
BLOWER BUILDERS R-C SINCE 1854
BLOWERS · EXHAUSTERS · BOOSTERS · LIQUID AND VACUUM PUMPS · METERS · INERT GAS GENERATORS

* * ONE OF THE DRESSER INDUSTRIES * *

quantity of water. The manufacturers claim that the per cent absorption of dissolved oxygen is greater than by other aeration methods.

Further information is obtainable on request.

Carborundum Adds to Sales Organization

To provide more effective contact between field sales activities and the sales management organization, The Carborundum Co. of Niagara Falls has announced the appointment of W. T. McCargo as Assistant Director of Sales in Charge of Operations in the Western Region with headquarters in Chicago. At the same time, John S. Hawley, formerly manager of the Commercial Research Department at Niagara Falls, has been appointed Assistant Director of Sales in the Central Region with headquarters in Cleveland, and John G. Fritzinger, formerly District Sales Manager, at Philadelphia, has been appointed Assistant Director of Sales in the Eastern Region with headquarters in Philadelphia.

Gordon LeFebvre Pres. Diesel Engine Manufacturers

At the recent annual meeting of the Diesel Engine Manufacturers' Assoc., Gordon LeFebvre, President of the Cooper-Bessemer Corp., was elected as the President of the Association.

Gordon Le Febvre

New vice presidents of the DEMA include Otto H. Fischer, Pres. of The Union Diesel Engine Co., and L. W. Metzger, Vice Pres. of The Baldwin Locomotive Works. Robert H. Morse, Jr., Vice Pres. and Gen. Sales Manager of Fairbanks, Morse & Co., was reelected Treasurer of the Association, and Harvey T. Hill was reappointed Executive Director.

One of the topics of discussion at the annual meeting was the growing seriousness of the situation with respect to supply and demand of diesel fuel oil. The Association plans a survey on how much diesel engine horsepower is now located in each state of the union, together with an estimate of how much this amount will increase over the next five years in an effort to arrive at requirements for fuel oil.

JOURNAL OF AMERICAN WATERWORKS ASS'N — December, 1947

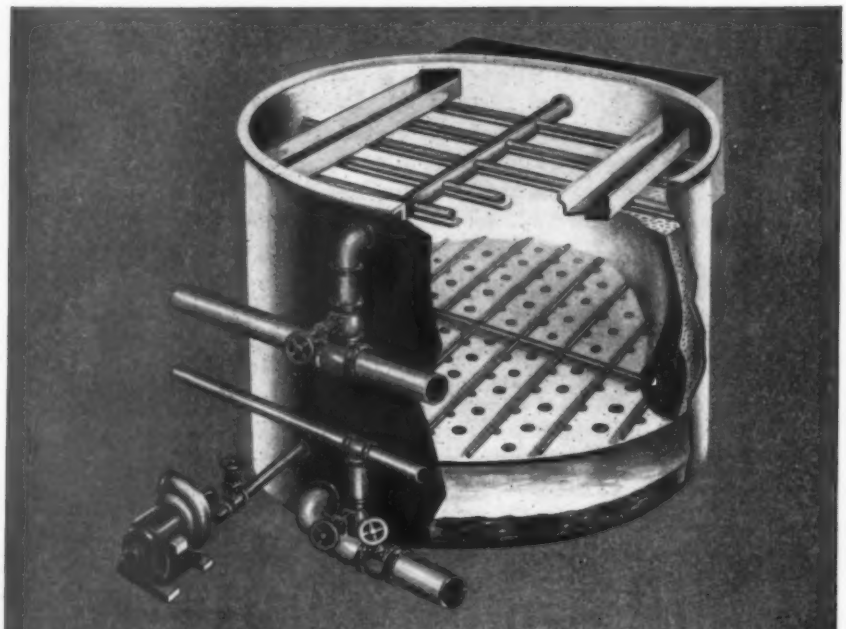
IRONFILTER

PROQUIP IRON AND MANGANESE REMOVAL UNIT
EFFICIENTLY ELIMINATES IRON AND MANGANESE PROBLEMS

A Superior Autocatalytic Method

● Objectionable Iron, Manganese and Gas are removed from water by a simple backwashable contact filter. This autocatalytic principle employing contact of previous freshly-formed precipitates combines precipitation and filtration of the metal hydrates . . . with remarkable effectiveness. Iron and Manganese are removed to 0.2 ppm or less by one pass of the water through the contact media. No chemicals are used. Very low head loss.

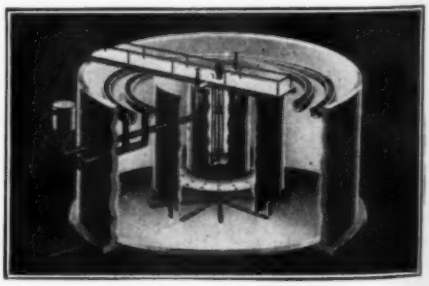
Write FOR BULLETIN 151



WALKER PROCESS EQUIPMENT INC.
YEARS OF EXPERIENCE TOGETHER IN EQUIPMENT ENGINEERING
AURORA • ILLINOIS

101 Flocculator and Settling Tank

Walker Process Equipment, Inc., Aurora, Ill., have designed the Clariflow, a short retention water treatment unit which provides individual functioning of mixing, reaction, flocculation, stilling and settling zones.



The Clariflow is offered by the company for cold lime softening, turbidity and color floc removal, and trade waste treatment and recovery.

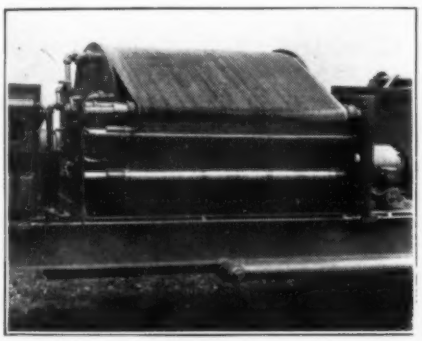
For cold lime softening the device can work as a single stage, two stage split treatment, or two stage series treatment. For turbidity and color floc removal, single stage flocculation and sedimentation or two stage flocculation and sedimentation are available. Trade waste treatment and recovery is based on single stage operation.

Two types of Clariflow are available, the nested and the separate. The nested Clariflow is built in circular, square or rectangular installations, as is the separate system, but in the latter the energy mix and reaction zone are separated from the flocculation, stilling, and final settling zones. Further information is available in a bulletin.

102

Cord Filter Demonstration Unit

A mobile apparatus is now available for testing a cord filter under actual plant conditions. This unit,



which is described in the November 1947 issue of *Water & Sewage Works*, has been developed by the Komline-Sanderson Engineering Corp., Ridgewood, N. J.

The unit is trailer-mounted and may be taken anywhere for demonstration under plant conditions.

The cord filter is a non-clogging filter medium which is cleaned automatically at each revolution. Drum construction is simple with filtrate pipes located outside the drum for easy maintenance. Replacement cord may be wound on the drum while the unit is filtering, thus saving time usually lost in maintenance or replacement of filter medium. Output of cake is constant, and spaces between cords, which are arranged in two layers running in one direction only, provide the porosity for filtration.

This portable cord filter which Komline-Sanderson has made available for field demonstration is a complete vacuum filtration unit, 4 ft. by 4 ft. size, equipped with sludge pump, coagulant mixing tank, vacuum pump and coagulant mixing pumps. Demonstrations can be arranged on request.

Fairbanks, Morse Open New Office

Fairbanks, Morse & Co. of Chicago has opened a new office and warehouse addition at its Westco Works in St. Louis. An open house party was recently held for more than 2,000 persons, including many executives from the Chicago headquarters who came to visit this new unit

where various types of industrial pumps are manufactured.

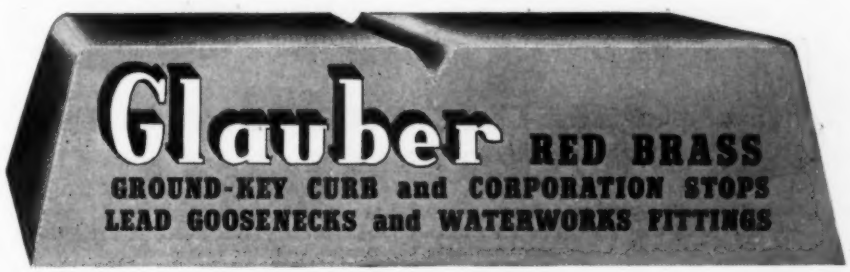
K-1400 Corporation Stop. Inlet standard water works thread; outlet copper service pipe with straight coupling nut.

Glauber Quality "PAYS OFF" WITH YEARS OF EXTRA SERVICE $ $ $

K-1410 Curb Stop with solid brass tee handle. Round way, inside iron pipe thread to copper service pipe.

Lifetime red brass metal, controlled precision machining and rigid inspection, plus years of experience are your warranty that Glauber fitted water lines will last longer. Designed for easy operation and in patterns for all regular installations, Glauber ground key fittings are truly your safest investment for trouble-free service. Write today for catalog and prices on your requirements.

THE Glauber BRASS MFG. CO., KINSMAN, O.
Division of H. B. SALTER MFG. CO., Marysville, Ohio



Saran Lined Pipe Co. Organized

The Saran Lined Pipe Co. has been organized to act as exclusive distributors for The Dow Chemical Company's recently developed specialty pipe and fittings.

The pipe and fittings, lined with Saran, a Dow plastic, was developed for use where highly corrosive materials are handled in manufacturing processes.

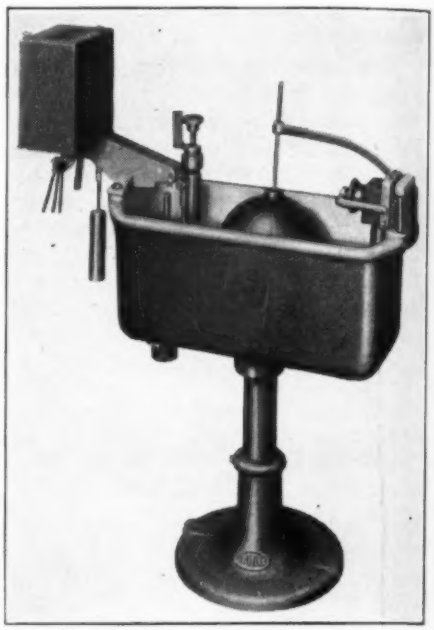
S. H. Blackmore, Sales Manager of Saran Lined Pipe Co., has offices located in the Stephenson Building, Detroit. The pipe and fittings are now in production at Dow's Midland plant and are immediately available.

103

Chemical Solution Feeder

The Infilco COE Chemical Solution Feeder is offered by Infilco, Inc., 325 W. 25th Place, Chicago 16, Ill., for the purpose of volumetrically measuring clear chemical solutions.

This device measures the flow of chemical solutions by automatically controlling the flow from a supply tank to obtain a constant rate discharge through an orifice operating under a fixed head. Means are provided for manual variation of the

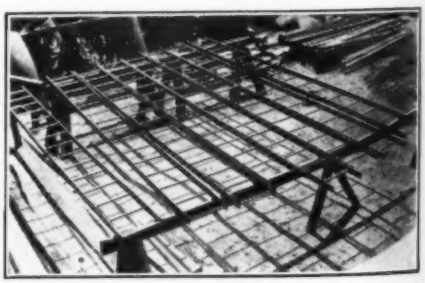


rate of feed by change of the orifice area and/or the head over the orifice.

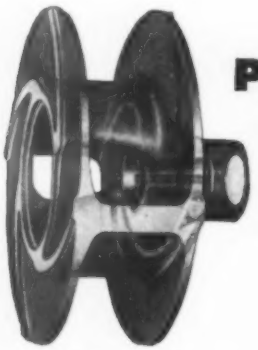
This device, which has a number of advantages, has found most frequent application in the measurement of coagulating chemicals used in the treatment of water, sewage, and trade wastes. These chemicals may include alum, sodium aluminate, ferric chloride, ferrous sulfate, soda ash, caustic soda, etc.

Further information is available in Bulletin 305-A.

Wrought Iron Ladders for Cleveland



The accompanying photograph shows the new wrought iron ladders for the 85 ft. deep Main Avenue water tunnel shaft in the City of Cleveland's Woodland Yard. These ladders are to replace wrought iron rungs, set in masonry, that had been in use for 50 to 55 years.



PEERLESS *Non-Clog* IMPELLERS KEEP SOLIDS MOVING...

NO RINGS TO CLOG – NO SEALS TO BIND

The improved Peerless Impeller, shown at left, has unique repelling vanes on both the outer shrouds, and scientifically designed working vanes of uniform thickness to assure *non-clog* pumping action. Peerless *Non-Clog* Sewage Pumps offer a dependable means of pumping entrained solids.

PEERLESS NON-CLOG SEWAGE PUMPS

Type NCH
Horizontal Type
For dry basin installation

Type NCV
Capacities: up to 7000 g.p.m.
Heads: up to 70 feet

A departure from the conventional construction of sewage pumps has resulted in an advanced design that has proved Peerless Sewage Pumps to be non-clogging in action as well as in name. All wearing rings, end plates, filler rings, etc., have been eliminated, and recirculation losses minimized. These pumps are designed for dry basin installation and are available in both horizontal and vertical types, for all types of drive, up to 100 h.p. For a minimum of down time and a maximum of clog-free service, specify Peerless *Non-Clog* Sewage Pumps.

Request Bulletin. All Peerless improvements and advantages in non-clog sewage pump design are described in this new bulletin. Write for No. B-154.

fmc PEERLESS PUMP

PEERLESS PUMP DIVISION
Food Machinery Corporation

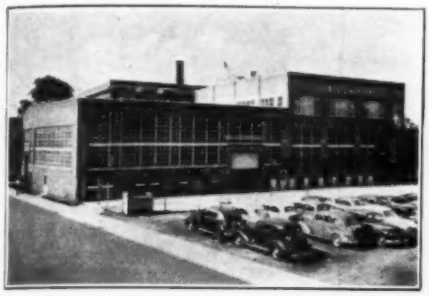
Factories: Los Angeles 31, Calif.; Quincy, Ill.; Indianapolis, Ind.

District Offices: Chicago 40, 4554 No. Broadway; Philadelphia Office: Suburban Square, Ardmore, Pa.; Atlanta Office: Rutland Bldg., Decatur, Georgia; Dallas 1, Texas; Fresno, California; Los Angeles 31, California.

The Cleveland Water Department has specified wrought iron for the new ladder because the old rungs of the same material had given such good service for so many years.

Jeffrey Expands Research Center

Jeffrey Manufacturing Co. of Columbus, Ohio, expanded their re-

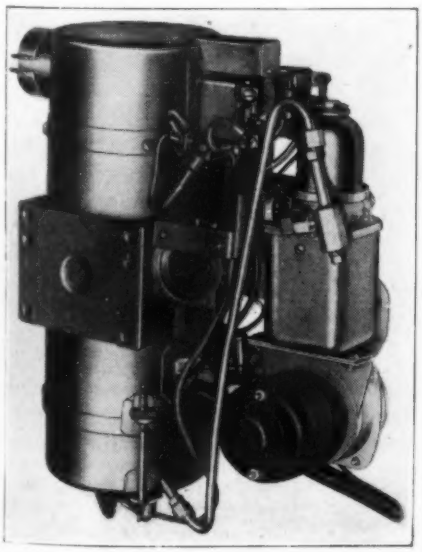


search work in a new research center. The accompanying photograph shows the recently completed research center which is modern in every respect.

It is equipped to perform tests of sufficient scope to insure accurate predetermination of field results. Also contained are experimental and pilot plant equipment. Experienced testing and development technicians and engineers supervise the performance of all laboratory work in this new building.

104

Engine Heater



For persons who are concerned with the starting and operation of trucks, tractors, locomotives, power plants, gasoline and diesel engines, farm equipment, road building machinery, contractors' machinery and automobiles, the new quick-starting Superfex "All Purpose" Engine Heater is offered by the Perfection Stove Co., Cleveland, O.

This heater works from the inside out by heating the engine coolant. By utilizing the heat from exhaust gases and by adding a hot air or external liquid heat exchanger, the heat generated serves to warm the oil, battery, cab, cargo, and other valuable parts of the equipment. As an auxiliary heater, it operates independently of the engine.

Physical dimensions of the Superfex Engine Heater are sufficiently small to permit mounting on automotive equipment, usually under the hood in the engine compartment. The "All Purpose" heater, fills a long-felt need for winter protection of valuable, heavy-duty equipment. There are five models of the Superfex "All Purpose" Engine Heater available.

Further information may be obtained by writing for it.

GOOD REPORTING— ON REAL ECONOMY!

"Flexible" Power Drive at work for the Melrose, Mass., Public Works Department, sewer divison. The equipment has paid for itself many times over according to PWD officials. (Photo: Leo T. Murray).

"A machine that makes money? Sure. If money saved is money made, then this machine makes money—both for the city and every taxpayer who helps make the city a going concern.

"The money-making machine is a Public Works Dept., 'Flexible' power-driven drain cleaner that cuts through obstructions in the city's sewer mains. A spiral cutting head at the end of a 300-foot spinning 'Flexible' shaft is the spear head of the machinery that cuts through roots and other obstructions that block sewers and surface drainage pipes.

"Formerly the same job was done by a hand operated mechanism that pushed jointed wooden poles through the clogged drains, and sometimes punched through an obstruction but seldom completely removed it, according to S. Hale Harding, superintendent of sewers and drains.

"With the powered equipment, which has been in use for about a year, a three-man crew can do a better job and do it faster. In the course of a year the crew can handle emergency calls, and perform maintenance work on nearly all branch and trunk lines in the city's 65 miles of underground sewers. In addition, there are 26 miles of surface drainage mains that have to be kept in first class condition, Supt. Harding said."

—as reported in
The Melrose Free Press.

COMPLETE DETAILS ON THIS TIME-SAVING, WORK-SAVING "FLEXIBLE" POWER DRIVE PRESENTED IN OUR NEW 36-PAGE MUNICIPAL-INDUSTRIAL CATALOG. WRITE FOR YOUR COPY TODAY.

FLEXIBLE SEWER-ROD EQUIPMENT CO.

9059 Venice Blvd. **Los Angeles 34, Calif.**

855 Board of Trade Bldg. Chicago 4, Ill.
401 Broadway New York 13
147 Hillside Ter. Irvington, N. J.
P. O. Box 165 Atlanta
41 Greenway St. Hamden, Conn.
1624 Harmon Place Minneapolis 3, Minn.
29 Cordan Ave. Roslindale 31, Mass.
P. O. Box 694 Pittsburgh
P. O. Box 447 Lancaster, Texas

Roberts & Brune New Mfrs. Representatives

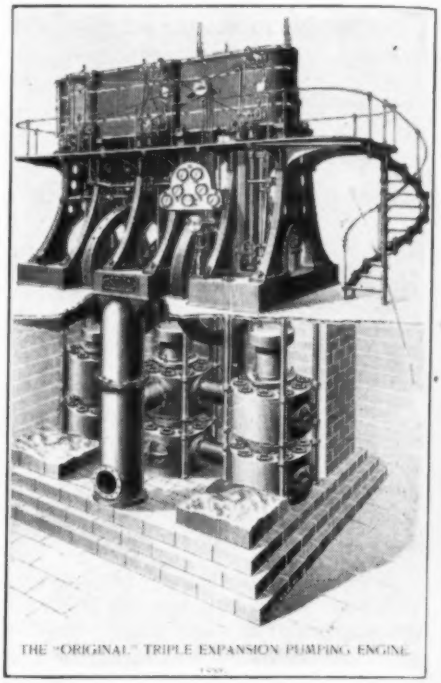
After representing the Rensselaer Valve Co. for 40 years, Fred H. Brune, formerly sales manager of the Chicago branch of that company, has joined with H. G. Roberts, district manager in San Francisco, to form a new company to be known as Roberts & Brune Co. They will act as sales representatives in northern California and Nevada for their former employers, as well as for the Atlas Mineral Products Co., Ford Meter Box Co., Payne Dean Co., and the Lee Hydraulics Co.

Allis-Chalmers' 100th Anniversary

Allis-Chalmers of Milwaukee, Wis., is completing its 100th year of engineering and manufacturing as a producer of major industrial products and power generation units.

The company has been associated with the water works industry for many years. In 1869, the company obtained a contract for 2,600 tons of pipe for a badly needed adequate water supply for Milwaukee. Then the company built the nation's first steam driven vertical reciprocating pumping engine, which was installed in 1874 in Milwaukee. Although the contract called for 16,000,000 gallons a day, the engines easily threw 20,000,000 gallons a day.

In 1884 the company produced the largest centrifugal pump in America for the city of Milwaukee. It had a 70 mgd. capacity against a 15 ft. head. This type of pump has grown in use steadily among municipal and industrial users.



THE "ORIGINAL" TRIPLE EXPANSION PUMPING ENGINE

In 1886, the company designed the first triple expansion pumping engine of the inverted type for the High Service Station of the Milwaukee Water Works.

In 1888, the company originated the first screw pump which was used to pump 500 mgd. a day for the purpose of flushing out the Milwaukee River.

Since the time Milwaukee's first pumping engines were set in 1874, the Allis-Chalmers company has never been out of the pump business, although this type of pump is no longer manufactured. One of their most recent installations was the eight giant pumps in the Chicago $240,000,000 filtration plant. Four of these have a capacity of 100 mgd. and four have a capacity of 50 mgd. The accompanying photograph shows the original triple expansion pumping engine.

R-S Products Electronic Division

The R-S Products Corporation has established an Electronic Division, under the direction of David W. Hop-

Repair broken water lines easily, quickly, without shutting down. Dresser Style 82 Repair Sleeve is installed in 5 to 10 minutes by one man using only a wrench. Adjustable to exact fit—even on off-size pipe—by means of interchangeable sections. A permanent repair *at low cost.* Specially compounded rubber gaskets provide flexibility, help prevent future breaks. For CIP from 4″ to 8″ in diameter.

"ADJUSTABLE" REPAIR SLEEVE STYLE 82

The modern, quick, low-cost repair sleeve.

DRESSER STYLE 82 REPAIR SLEEVES

ONE OF THE DRESSER INDUSTRIES

Dresser Manufacturing Division, Bradford, Pa. • 1121 Rothwell St., Houston, Tex.
In Canada: Dresser Manufacturing Co., Ltd., 60 Front St., West, Toronto, Ont.

kins, Exec. Vice. Pres., and Donald C. Culver.

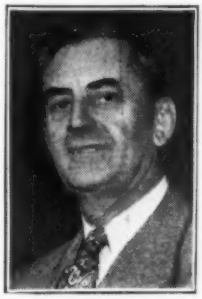
New products, such as the Leveltronic, or level control unit, for the control of fluid level, pressure and temperature, will be handled by the Valve Division representatives of the company.

E. A. Longenecker New Le Roi President

C. W. Pendock, Resigned, Now Board Chairman

Le Roi Company of Milwaukee, Wis., has announced the resignation of its president, C. W. Pendock. Mr.

E. A. Longenecker

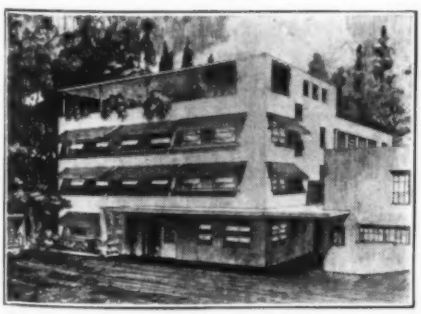


C. W. Pendock

Pendock has been the only president in the company's history from its growth from a small machine tool shop in 1914 to its present position in the industry. Mr. Pendock was elected to the position of chairman of the board, and in his place as president Mr. E. A. Longenecker was elected.

Mr. Longenecker had been president of the Lauson Division of Hart-Carter Company.

National Technical Labs Expand



National Technical Laboratories, manufacturers of Beckman pH instruments, Spectrophotometers, and other control equipment, has expanded its facilities to meet the increasing demand for its products.

The accompanying photograph shows a recently completed new addition in South Pasadena, Calif. Four stories high, with an excess of 27,000 sq. ft., the new building brings the total of space available to 60,000 sq. ft., devoted to the development and manufacture of various Beckman instruments.

105

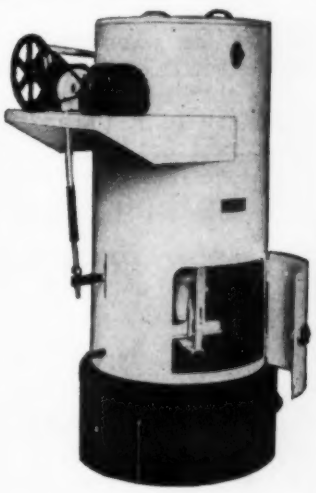
Insecticide

A new chemical compound called Thiophos 3422 has been developed by the American Cyanamid Co. and will shortly be available. This insecticide is effective against a wider range of insects, mites, and other lower invertebrates than any chemical now in practical use, including nicotine, rotenone, DDT, and other compounds.

The material, which was developed from a German formulation discovered by British and American scientific teams after the war, is a liquid but may be made into powders from which it can be used as a spray or as a dust.

If you're up in the air about chemical feeding, you need an OMEGA! The OMEGA Universal is famous for unfailing operation . . . it feeds dry materials at exactly the rate desired, accurately and dependably, regardless of lumps or trash that clog ordinary feeders. OMEGA design features large throat and orifice openings, with effective agitation in the hopper and at the outlet zone. Dissolving chambers are designed to provide adequate retention and mixing before the solution passes to the point of application. Feeding rate is adjustable by a micrometer screw over a 40 to 1 range, with accuracy maintained within 5% or better. The Universal in three sizes has a feeding range from 1 lb. to 5000 lbs. per hr. Dust collectors, extension hoppers and proportional feeding controls are available.

Write for Bulletin 1-4



OMEGA *Universal Feeder with Dissolving Chamber*

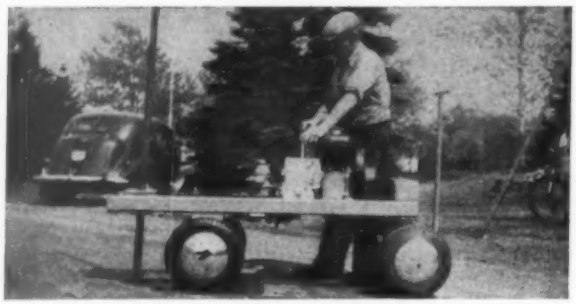
OMEGA PRODUCTS

Volumetric Feeders • Gravimetric Feeders
Solution Feeders • Lime Slaking Equipment
Bucket Elevators • Laboratory Stirrers

OMEGA MACHINE CO.

(Division of Builders Iron Foundry)
10 CODDING STREET, PROVIDENCE 1, R. I.

PAYNE DEAN GATE OPERATOR



A 5 HP gasolene engine or electric driven gate operator for portable use. Closes gates up to 30 in. in minutes. Pneumatic tires for rough ground. Transported in pickup truck. Easily loaded. Ideal for operating large floorstands.

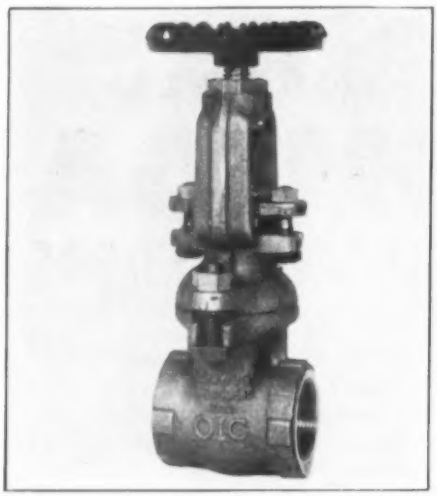
Truck mounted operator for all gates up to 60 in. Mounted on any truck in a few hours. Closes gates in minutes. Used by all principal cities. Prompt shipment. *Write for literature.*

PAYNE DEAN & CO., P. O. Box 271, Madison, Conn.

106

Corrosion-Resistant Valve

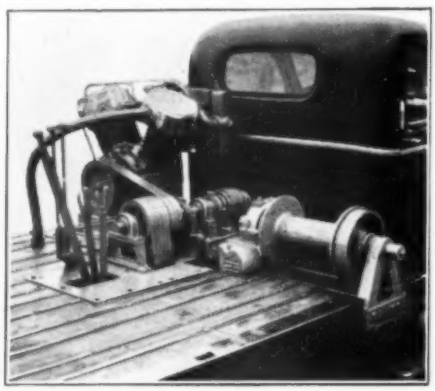
A new corrosion-resistant stainless steel valve has been produced by The Ohio Injector Co. of Wadsworth, Ohio. The valve is designed expressly for chemical, processing, food industries, or wherever the service calls for corrosion-resistant valves.



It is obtainable in sizes of ½ to 2 inches and is of the outside screw and yoke type, having bolted bonnet, tapered wedge, and screwed ends.

107

Compressor-Winch Assembly



The development of a new truck-mounted "Auto-Air" compressor-winch assembly has been announced by the Davey Compressor Co. of Kent, Ohio. Power for operation of both compressor and winch is transmitted from the truck engine by a Davey Heavy Duty Power Take-off. The compressor is a standard Davey Model 105-VC "Auto-Air," delivering 105 cfm. at 100 lb. pressure. The winch is of 25,000 lb. capacity.

The assembly is recommended for pipe line, public utility, etc. Write for further information.

108

Electric Screen Installation

The "Shock Stick," for many years a prankster's plaything and a cattleman's fence, continues in its new found job of electrically steering

The SEWER SCOOTER

(U. S. Patent 2,198,823)

THE ONLY 100% SELF-PROPELLING SEWER CLEANER

THE FLUSHING ACTION IS APPLIED BY COLLAPSING THE SHIELD.

A patented feature

No Preliminary Work — Gets Results in a Hurry

SEWER SCOOTER MODEL A-3, BRONZE

Standard machines stocked 8 inches to 96 inches—For sale, rent or contract.

J. C. FITZGERALD

Box 289-A
Coral Gables 34, Fla.

millions of food fish safely past water intakes in irrigation canals, etc.

These electric fish screens, invented by Henry T. Burkey of 1130 N. Poinsettia Place, Hollywood, Calif., and described in our Equipment columns some two years ago, continue to find wide application.

An electronic generator, developed jointly by Burkey and the Westinghouse Electric Corp., produces a special wave form of electric current which discharges from a row of freely swinging electrodes.

109

"G-H" Shockproof Curb and Valve Boxes Now Made of Transite

(Excerpts from a Letter to the Editor)

Dear Mr. Enslow:

You will recall that Mr. Otto A. Halvorson, Mechanical Engineer, and myself, as Engineer of Distribution, Milwaukee Water Works, applied for patents on a telescopic type of curb box and gate valve box, known as the **"G-H Shockproof Curb and Valve Box"** (the use of the word "Shockproof" is our own designation) and that we had entered into a year's contract, on August 7, 1946, on a royalty basis with Mr. George Riordan of Milwaukee, operating as the "Pilot Engineering Service," to manufacture and sell without prejudice the box known to the inventors as the "G-H Shockproof Curb Box." This he has done for a period of one year, ending August 7th past, at which time the arrangement was terminated.

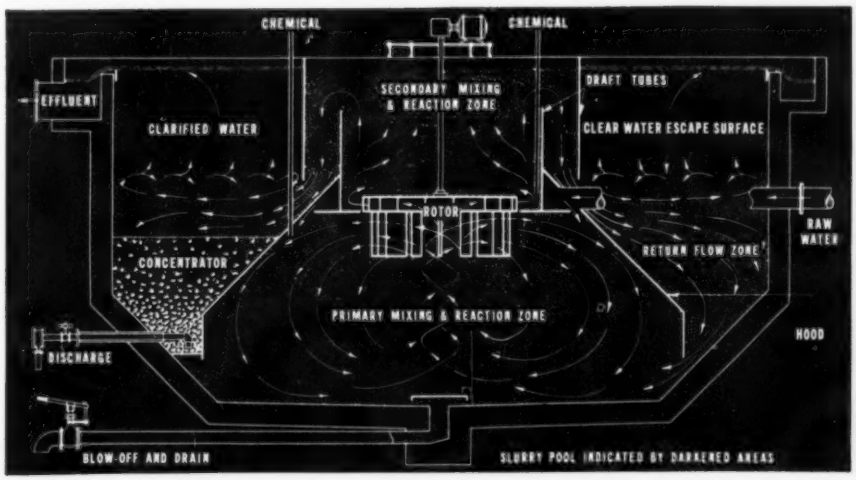
During this period a notice appeared in your publication *"Water & Sewage Works"* crediting Pilot Engineering Service with the development of the "G-H Shockproof Curb Box." In calling to your attention the error of this notice you kindly inserted another notice that we, Halvorson and I, were the true inventors of this equipment and applicants for patents on this novel curb box.

We have recently noted in another magazine advertising by Pilot Engineering Service offering an illustrated "Shock-Proof Curb Service Box" which we consider to be a bold misappropriation of our patent design.

Our dealings with Mr. Riordan having been unsatisfactory, Mr. Halvorson and I have signed a contract with the Verako Products Company of Waukegan, Ill., to manufacture and sell curb and valve boxes of our design fabricated from transite pipe materials, obtained from the Johns-Manville Co. nearby. Verako Products Co. are enlarging their facilities, for manufacturing various products from transite materials, and distributing same to the trade, among which is our "G-H Shockproof Curb Box" and "G-H Shockproof Valve Box," which has had an increasing demand from critical users of such materials. Needless to say, we feel that our boxes made of transite materials are much superior in quality and performance to the original design, involving use of the tar impregnated fiber tubing, which Pilot Engineering Service continues to manufacture and advertise without authorization of Mr. Halvorson and myself. We thought that your readers should be advised of the above history and developments pertaining to the "G-H Shockproof Curb and Valve Boxes."

Yours very truly,
Clarence S. Gruetzmacher
Engineer of Distribution
O. A. Halvorson
Ass't. Mechanical Engineer
Milwaukee Water Dep't.

"Dynamic Separation" with the ACCELATOR



The ACCELATOR* has an exclusive operating principle that differentiates it from all other types of water-treating equipment. It has a directed flow of slurry and "dynamic separation" of treated water from the surface of the flowing slurry.

Treated water separates and rises freely approximately at right angles to the surface of the controlled lateral flow of slurry instead of slowly percolating up through a sludge blanket. This enables the ACCELATOR to deliver treated water faster.

ACCELATOR installations regularly report a high quality of treated water.

Send for a copy of ACCELATOR Bulletin 1824. INFILCO Inc., 325 West 25th Place, Chicago 16, Ill.

*Trade-Mark Reg. U.S. Pat. Off.

ACCELATOR *Advantages*

- Highest Rate
- Dynamic Separation
- Positive Recirculation
- Heavy Slurry Concentration in Mixing Zone
- Custom-Built Concentrator
- Rotor Circulator

IF YOU WANT TO KNOW — ASK INFILCO

FEED-METERS-MIXES
CHLORINE GAS ACCURATELY

PURIFICATION FOR WATER-SEWAGE & SWIMMING POOLS

Everson SterElators Operate Manually or Semi-Automatically, Also Automatically Proportion Gas Flow to Water Flow.

Everson SterElators Utilize a 24" Water Gauge Vacuum and Visible Flow Meters, with Wide Ratio Ranges of Capacities: 10 to 1, 50 to 1, 110 to 1.

All SterElators Are Dependable, Accurate, Safe and Easy to Operate. Guaranteed to Give Complete Satisfaction.

SterElators by Everson

EVERSON MFG. CO.
233 W. Huron Street
Chicago 10, Ill., U. S. A.

71 ... FREE
Power Plant
Cleaning Tips

Yours for the asking — the Oakite "71" Digest. It tells how you can speed up such maintenance cleaning jobs as

- Stripping Paint from Transformers
- Removing Slime and Scale
- Cleaning Condensate Meters
- Salvaging Valves

You'll find data on these and sixty-six other cleaning jobs where Oakite methods and materials can save you time and cut your cleaning costs. Send today for your FREE copy.

OAKITE PRODUCTS, INC.
73 Thames Street, NEW YORK 6, N. Y.
Technical Representatives in Principal Cities of U. S. & Canada

OAKITE

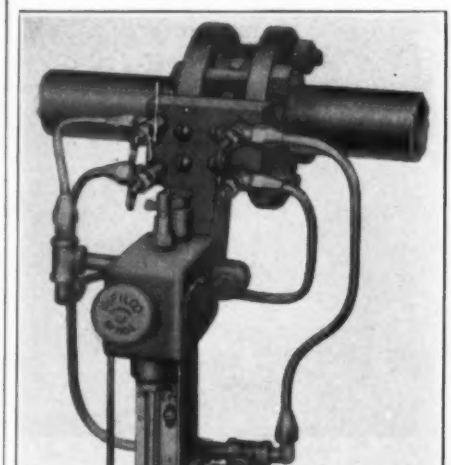
Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

110
Detergent

For the laboratory technician or chemist in the water and sewage plant there is now available a new synthetic detergent for washing laboratory glassware. Under the name Cutscum, Eimer and Amend of New York City are offering this material in a bottle with a handy medicine dropper. This material, which does away with soap, is a polyethylene glycol, a non-ionic detergent. One bottle of Cutscum is sufficient to condition 160 gallons of laboratory wash water.

111
Rate of Flow Indicator

A device to indicate the rate of fluid flow in one or both directions has been announced by Infilco, Inc., 325 W. 25th Place, Chicago 16, Ill.



This rate of flow indicator, Style 0, is adapted to such applications as checking the capacities of pumps, ascertaining whether filters are operating at correct rates, determining whether filters are being properly backwashed, and indicating whether valves have to be adjusted where one water stream is broken up into two or more smaller ones.

The principle of operation is an orifice plate installed in a line through which liquid is flowing, de-

HYDRO-TITE
JUST POUR
THAT'S ALL

Hydro-tite, the self-caulking, self-sealing, pipe-jointing compound, solidifies and hardens immediately without shrinkage. No caulking is necessary. Any slight seepage that may appear at first soon stops.

For over thirty years Hydro-tite has proved its ability to stand up under all conditions of strain, vibration and pressure. Send for data book and sample.

ALWAYS USE FIBREX

The sanitary, bacteria-free packing that costs about 30% less than braided jute. Send for sample.

HYDRAULIC DEVELOPMENT CORPORATION
Main Sales Office: 50 Church St., New York, N. Y.
Works: West Medford Station, Boston, Mass.

WILL SELL

1,000 tons Cast Iron Water Pipe 12" to 30" in diameter inclusive

ALSO

500 tons Water Fittings, various sizes from 4" to 30" in diameter

Phone, Wire, or Write —

Albert Pipe Supply Co., Inc.
Berry and N. 13th St.
Brooklyn 11, N. Y.
EVERGREEN 7-8100

veloping a pressure differential measured on a mercury manometer.

Further information is available on request in Bulletin 1070-A.

112

Adjustable Steel Shelving

Precision Equipment Co., 2658 N. Long Ave., Chicago 39, Ill. has begun production of steel shelving which features a quick-action clip for rapidly adjusting space between shelves. The company also makes steel drawers, steel cabinets, filing cabinets, work benches, lockers, etc.

LITERATURE AND CATALOGS

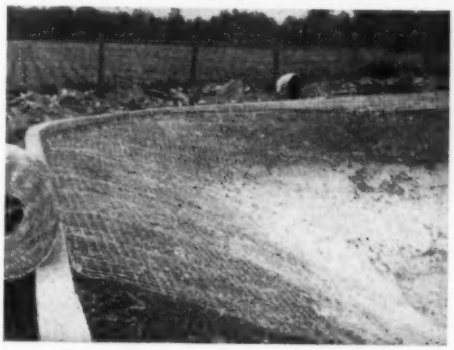
113

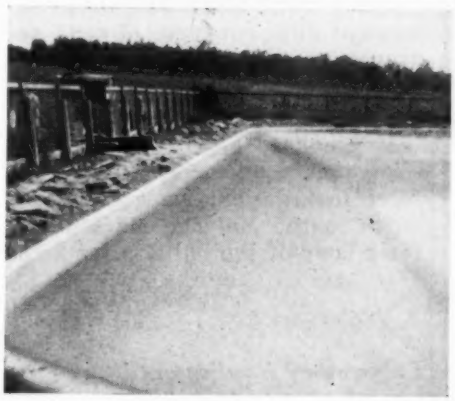
Protective Coatings

"A Water Works Superintendent Speaks" in the **Inertol Reporter** and tells of his experiences with the use of RAMUC (Inertol's Utility Enamel) and other Inertol protective coatings. L. S. Duckworth, Supt. of Filtration of the Lancaster, Penna., Water Works, points with pride to his filter room ceiling and walls which were painted with Ramuc in 1940 and have not been repainted since.

According to the story, Mr. Duckworth told the Inertol Reporter, his use of TOREX on the filter walls has made it possible to brush algae growths from those walls with but little effort compared to the hard job it was when the walls were uncoated. Duckworth also uses TOREX on the dry feed machines and alum mixing tank and has found that corrosion is eliminated. If you are interested in the successful application of these products in the Lancaster plant, write Mr. Duckworth or the Inertol Co., Inc., 480 Frelinghuysen Ave., Newark 5, N. J. The particular folder from which this story was taken is No. 589, which also describes a protective paint job on the Atlantic City sewer as well as the use of these paints at a sewage pumping station in San Francisco. Inertol Standard Thick is recommended for sewage plants, and RAMUC Utility Enamel for both water and sewage works.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.





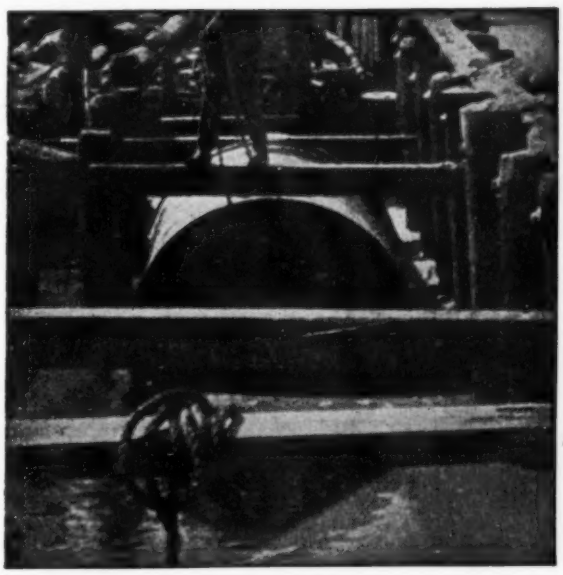
NO MAINTENANCE IN 23 YEARS

The before and after photos show a reservoir we re-lined with "GUNITE" in 1925 for the Village of East Aurora, N. Y. Recently Mr. V. E. Haemmerlein, Village Engineer, wrote us:

"The job you did of Guniting our reservoir is still in first class condition. Some hair cracks have developed near the top. I drilled one-half inch holes where some of these cracks showed but find that they are only about one inch deep. They do not go beyond reinforcing. We have made no maintenance whatsoever."

We can similarly solve your problem if you have an old leaky or disintegrated reservoir. We invite you to call on us for complete information, recommendations or estimates on any "GUNITE" work which you may be planning.

Our 72-page bulletin C2300 describes this job and scores of other profitable uses of "GUNITE." Write for your free copy today.



84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 2" TO 84"

Warren Foundry & Pipe Corp.

11 Broadway, New York

Warren Pipe Company of Mass., Inc.

FOR BETTER
pH Control
and WATER TESTS
there is nothing like
NON-FADING
GLASS COLOR
STANDARDS

Pocket Comparator No. 605

Permanent reliability of Hellige Glass Color Standards, accuracy of color comparison, simplicity of the technique, and compactness of the apparatus are exclusive features of Hellige Comparators not found in any similar outfits.

WRITE FOR BULLETIN No. 602

HELLIGE
INCORPORATED
3718 NORTHERN BLVD. LONG ISLAND CITY 1, N.Y.
HEADQUARTERS FOR COLORIMETRIC APPARATUS

WRITE FOR INFORMATION

VOGT BROTHERS TRAFFIC MODEL FIRE HYDRANT

A.W.W.A.

VOGT BROTHERS MFG. CO. Incorporated LOUISVILLE, KY.
MAIN AT 14th
VOGT
VOGT MFG. CO., Incorporated LOUISVILLE, KY.
P. O. BOX 1122

AERO-MIX

AERATOR—MIXER

A Size and Type to Fit Your Problem in Water or Sewage Treatment.

WRITE FOR INFORMATION

114

Filters

The Holyoke Machine Co., of Holyoke, Mass., has recently issued a catalog on **Holyoke Filters** for pressure type and gravity type. These filters, offered for industrial, municipal, and swimming pool installations, are thoroughly described in the bulletin which discusses such items as industrial filtration, Holyoke pressure filters, Holyoke gravity filters, coagulation, coagulating tanks, basins, and equipment, air washing, construction of the filters, operation, strainer systems, etc.

The book also discusses how to get better results from the filters and the advantages and disadvantages of different types of sand and gravel, as well as the 4-way piston type valve for operating hydraulic valves in the Holyoke systems.

If you have a problem in industrial, municipal, or swimming pool filter installation, we suggest you write to the Holyoke Machine Co. for a copy of the bulletin.

115

Laboratory Equipment

In a sixteen page catalog of **Modern Equipment for the Water and Sewage Laboratory,** Phipps and Bird, Richmond 5, Va., have shown many of the best pieces of laboratory apparatus and instruments for use in water and sewage works. Turbidimeters, pH and chlorine comparators, water stills, steam sterilizers, stability indicators, Imhoff cones, B.O.D. incubators, dissolved oxygen samplers, comparators for the determination of phosphates, etc., in boiler waters, Coleman pH electrometers, and many other items are included. This bulletin is a reprint of special items from Phipps and Bird complete catalog R41 of Scientific Laboratory Apparatus.

116

Butterfly Valves

The Valve Division of R-S Products Corp., Wayne Junction, Philadelphia 44, Penna., has issued two Bulletins No. 16-B and 18-B. The first titled **Specifications—15 to 125 psi.** gives all the data on various sizes of valves for regulation and shut-off duty for air, gas, steam, liquids, and semi-solids. Both manual and automatic control are available.

Leopold

• **GLAZED FIRE CLAY TILE FILTER**

Non-corrosive, permanent.

• **DRY CHEMICAL FEEDERS**

Compact, light in weight, durable, accurate. Sizes and capacities to suit any operating requirements.

• **COMPLETE WATER TREATMENT AND FILTER PLANT EQUIPMENT**

Designed and built by Leopold engineers to handle any service.

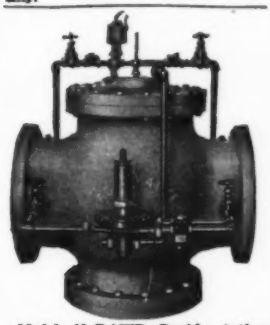
Write today for complete information.

F. B. LEOPOLD CO., INC.
2413 W. CARSON ST. PITTSBURGH 4, PA.

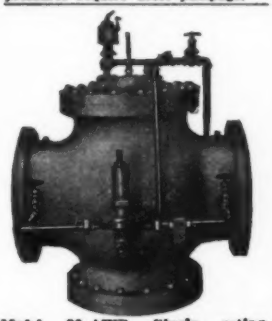
For Sale
2 NEW 400 H.P.
VERTICAL WESTINGHOUSE
INDUCTION
MOTORS
3 phase—60 cycle
2200 Volt
700 R.P.M.
in original crates.
Very attractive price.
Write, wire or phone
SONKEN-GALAMBA CORP.
2nd and Riverview (R-173)
Kansas City 18, Kansas
THatcher 9243

Est. 1879
ROSS
AUTOMATIC
VALVES

Altitude Valves for tank and reservoir, with two sets of controls—Automatic Hydraulic and Electric Remote Control. Hydraulic pilot normally operates the valve, while electric pilot is used for emergency only.



Model 40-DAWR Double Acting may be operated by electric pilot regardless of elevation of water in tank or reservoir, for a break in supply or distribution and when fire pressures require direct pumpage.



Model 30-AWR Single acting valve may be controlled in same manner as the Model 40-DAWR.

Model 40-AWR Single Acting semi-throttling valve will close on reversal of flow and the electric pilot would serve only a single purpose—either to open wide or close as emergency may require.

ROSS VALVE MFG. CO.
Incorporated
P.O. BOX 595, TROY, N.Y.

The second bulletin specification data on various sizes of **150, 300, and 600 lb. Cast Steel Valves** for quick control and shut-off under high pressure and temperature. Both bulletins are available on request.

117

Centrifugal Blowers And Exhausters

A new 12-page booklet, No. A-650, describes many applications of **Hoffman Multistage Centrifugal Blowers and Exhausters** on production operations which require air pressure from one to eight psi. or vacuum from 2 to 11½ in. of mercury.

The booklet describes design features graphically and presents operating characteristics and advantages. Charts showing capacity ranges as well as "Handy Data" tables and conversion factors and graphs are also given. The booklet is issued by the United States Hoffman Machinery Corp., Air Appliance Div., 105 Fourth Ave., New York 3, N. Y., and may be obtained on request.

118

Protective Coatings

The Wailes Dove-Hermiston Dept. of Koppers Co. has released a four page bulletin on **Bituplastic,** which is not a paint but is a highly refined easily workable coal tar pitch coating. The folder describes the uses and advantages of the coating and tells how it can be applied, as well as giving other useful information about the product. This folder is obtainable on request. The Wailes Dove-Hermiston Dept. is located in Westfield, N. J.

119

Water Conditioning Equipment

The Liquid Conditioning Corp. of Linden, N. J., has just issued a 60-page bulletin. This bulletin is a revision of a previous publication giving the most recent developments in design of **Water Treatment and Liquid Conditioning Equipment.** All types of water conditioning processes and equipment are described and the application, advantages, and limitations of each type explained. Tables, charts, and diagrams further increase the usefulness of this bulletin to persons interested in liquid conditioning.

The bulletin may be obtained on request to the Liquid Conditioning Corp., 114 E. Price St., Linden, N. J.

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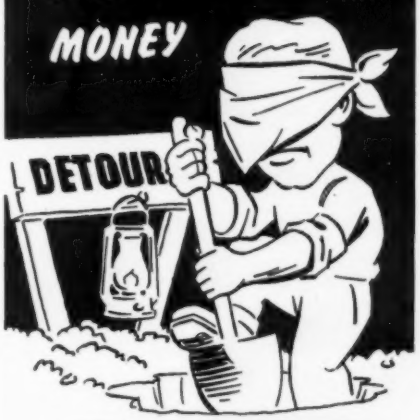

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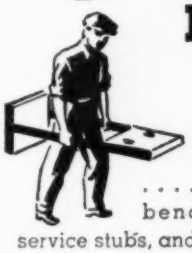

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120

Cast Iron Pipe

Each issue of **The U. S. Piper,** published by the U. S. Pipe and Foundry Co., contains several stories of the installation of cast iron pipe in various locations and for various reasons. The December 1947 issue is no exception. In that issue are stories on a new raw water intake for Poughkeepsie, N. Y.; cast iron pipe for three types of sewers in Hamden, Conn.; a flexible joint cast iron pipe water supply line for Alameda, Calif.; and an intercepting sewer of C. I. pipe in a suburban area of Philadelphia. The U. S. Piper will be sent to anyone requesting that his name be added to the mailing list.

121

Indicating Controllers And Recorders

For instrument men in industrial plants as well as scientific laboratories, the Leeds & Northrup Co. of 4907 Stenton Ave., Philadelphia 44, Penna., has published a new 16-page catalog, No. ND44(2), to serve as a handy guide to the **Micromax Model R Indicating Recorders and Controllers.** That such equipment has a place in water and sewage works and industrial waste treatment is evident from a story in Vol. 7, No. 3, of **Modern Precision** published by Leeds & Northrup. In this house organ is a story of how "Micromax pH Control Helps Bakelite Co. Neutralize Waste." The story tells how the pH of the waste is controlled by an automatic Micromax Controller which not only controls the addition of the neutralizing chemical but gives a continuous record showing that the waste has been held to within the allowable tolerances.

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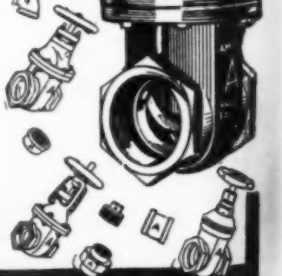

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122

Research Development

The Jeffry Manufacturing Co. of Columbus, Ohio, has just completed a new research center and has issued a six page folder describing the new building and showing the equipment and apparatus available for use in the new center. If you want to know where some of your problems may be attacked write to Jeffry Mfg. Co.

123

Lime

Under the intriguing title of **The South Kept This Secret for Over 300,000,000 Years,** the National Gypsum Co. of Buffalo, N. Y., describes one of the world's finest limestone deposits at Kimballton, Va.

In a large, well illustrated folder, the National Gypsum Co. shows the layout and design of its newest and most modern lime processing plant. Also shown are large photographs of the operations in the mine and the operations of the mechanical handling equipment, the rotary kilns, calcination, and operations. In addition, controls, both mechanical, electrical, and laboratory, are shown, as well as the devices for hydrating the lime, pulverizing the limestone, and storing the material. Both the powdered hydrated lime and pebble quick lime of high calcium content are offered by the company for use in water treatment.

The bulletin is available on request to the National Gypsum Co., Buffalo 2, N. Y.

124

Copper-Base Alloys

In the November 1947 issue of the **Copper & Brass Bulletin,** issued by the Copper & Brass Research Assn., 420 Lexington Ave., New York 17, N. Y., there is a story about the use of Copper-Base Alloys in sewage treatment plants. Photographs of a number of New York City sewage works are shown and the article tells how these alloys have been specified in many instances by the designers of sewage treatment works. The various types of alloys and the uses for which they are specified are given in the article. The Copper & Brass Research Bulletin is available on request if you are interested in obtaining materials of non-corrosive nature for use in and about sewage treatment works.

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12	2.5	6.00	2.25	20.86
14	2.5	7.00	2.25	24.02
16	2.5	8.25	2.25	33.07
18	2.5	9.25	2.25	36.88
20	2.5	10.50	2.25	40.71
24	2.5	13.00	2.50	53.02
30	2.75	16.00	2.50	65.36
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125

Cooling Equipment

For those of you who have an interest in cooling equipment, we may suggest that you request **Bulletin CE-47** of the Santa Fe Tank & Tower Co., 5401 S. Boyle Ave., Los Angeles 11, Calif.

This bulletin contains all the information desirable on the construction and operation of cooling systems.

126

Trickling Filters and Clarifiers

Lakeside Engineering Corp., 222 W. Adams St., Chicago, Ill., has issued Bulletin No. 115 titled **Trickling Filters and Spiraflo-Clarifiers.**

This 30-page bulletin contains a complete discussion of single and two stage aero-filters and their operation, together with distributor sizes, methods of recirculation, artificial ventilation, effects of temperature, size of media, operating heads, special tile media, etc. Blueprints of the various designs of the aero-filter and its equipment are given for various types of recirculation.

Also included in the bulletin are photographs and diagrams of the Spiraflo-Clarifier.

Bulletin No. 115 is available on request.

127

Service Tunnels

How to provide underground passageways for people, merchandise or utility lines is the subject of a new manual by Armco Drainage & Metal Products, Inc., Middletown, Ohio.

This 24-page manual of underpasses and service tunnels provides pictures and data on sizes and shapes of openings, etc.

A limited supply of the manuals is available.

128

Packaged Regulectric A-C Generator

In Vol. 8, No. 3a, of the **Synchronizer,** published by the Electric Machinery Mfg. Co., 821 Avenue S. E., Minneapolis 14, Minn., there appears a story of the new packaged regulectric A-C generator. This is a new compact, easy to install and easy to operate generator with a built-in automatic constant voltage. The Synchronizer also contains an article on "How to Apply Packaged A-C Generators" and gives seven handy tables for generator and wire selection. The Synchronizer may be had by writing for it.

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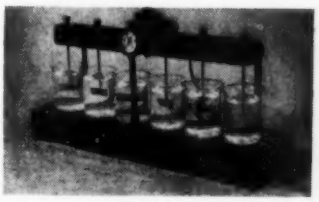

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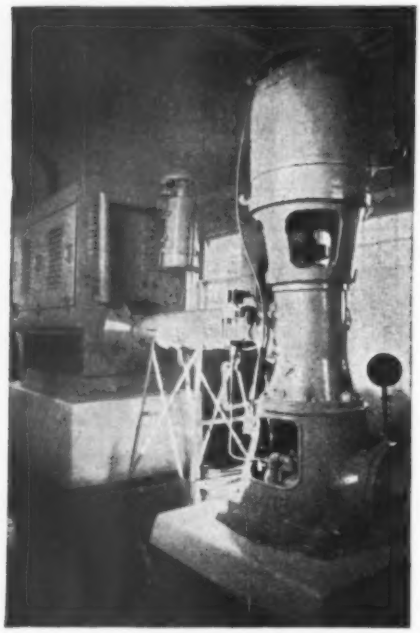

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DORRCO DOINGS IN 1947

Our first year of bi-partisan control since 1933 has passed and brought the first evidence that the labor road is not a "one way street" and that the American people, through their representatives, can rebel against excesses. Every evidence today indicates this is as satisfactory to labor's rank and file as to John Q. Citizen. Elimination of price control, however, with the greatest excess profits going, not to big business, but to the nominally-unorganized farmers, puts the second of our specially-privileged classes in the limelight.

Our country has been united on foreign policies. The great advance of the year has been recognition of the world-wide struggle between an active, controlled ideology, which feels that to survive it must spread, and a brand of Democracy that believes individual freedoms and spiritual standards are worth fighting and living for, and that the power of spirit and good will must triumph in the end. For the "practical" man, an increase in output of over 25 percent at the Victoria Coal Pit in Staffordshire, England, speaks for itself and is credited by the union head to a new spirit of honesty and unselfishness inspired by the "Moral Re-Armament Group."

* * *

ORGANIZATIONAL—Much has been done to improve our "inner workings" and to resume our world-wide coverage in present and anticipated fields.

The Dorr Company really started when, while doing engineering work, the Classifier and Thickener were developed. During the past forty years, much consulting work has been done in our specialized fields. This work has now been formalized by our establishing a Consulting Engineering Department, to focus and make available over 40 years of experience throughout the chemical and metallurgical worlds.

Work of this type exceeded our previous peak year and covered a broad variety of projects, ranging from preliminary studies and economic analyses, through laboratory and pilot plant investigations, to the design and specification of complete plants.

FLUOSOLIDS—The roasting of arseno-pyrite gold concentrates for cyanidation on a commercial scale is now a reality and small scale work in similar fields gives promise of success. A pilot plant operation on a crystalline limestone, in which many unexpected problems were overcome, has resulted in plans for a 100 ton commercial plant, now in the design stage.

CHEMICAL PROCESSING—We have collaborated on plans for the conversion of numerous war-born plants and techniques to peace-time economy, including processing improvements and expansions in such diverse fields as alumina, magnesia, titanium, potash, phosphates and catalysts. Abroad, the highlight was an order for 36 major equipment units to convert the chief Alsatian potash plants from leaching to froth flotation.

CEMENT—Continued activity both here and abroad has been evident. Two new American plants have installed our closed circuit grinding system, and three others have enlarged and improved existing plants with Dorr equipment. Abroad, the further acceptance of Dorr C.C.G. and the thin slurry process has been indicated by equipment supplied for North and South Africa, China, Chile and Mozambique.

HIGH SPECIFICATION SAND—Our service to this field was highlighted by a complete Dorr installation in the Northwest, the solution of a special silica sand problem in California and the equipping of a barge on the East Coast for an entire sand and gravel washing and grading operation.

CHEMICAL PULP—Our score this year was five continuous recausticizing systems for new chemical pulp mills with an aggregate output of 700 tons per day, plus additional equipment for the modernization or expansion of four other mills.

SUGAR—Cane sugar managements have continued the major overhauling of factories neglected since 1930 and in this rehabilitation the use of Dorr Multi-feed Cane Juice Clarifiers and Oliver-Campbell Cane Mud Filters has been conspicuous. Beet sugar manufacturers continue their demand for more Dorr equipment, with the accent on our De-Ionization System.

In England we started up this year a mud disposal plant to utilize, for land-building purposes, the mud washed from sugar beets. We have an order for another for the same purpose in Hawaii.

DE-IONIZATION—Milestones in the rapid progress of D-I have been the successful initial operation of two large units in the sugar and syrup industries and the erection of our first beet sugar pilot plant abroad. In Hawaii, at one plant, D-I is producing an edible sugar syrup, equivalent to an additional recovery of 8,000,000 pounds of sugar per year. Another D-I, at a large beet sugar factory, is expected to increase the sugar extraction 10 percent.

SANITATION—The year saw the first signs of the long-awaited upturn. Our major projects were equipment for San Diego's novel sewage plant; for Oklahoma City's two new sewage plants (one a 25 MGD biofiltration plant, the world's largest); and, for the Sanitary District of Chicago, replacements for 8 special Dorr Clarifiers, now 20 years old and obsolete.

In the water field, large installations of Dorrco Flocculators are being made at Washington, D.C., and Dallas, Texas; while, in active Latin America, we are modernizing one section of the Buenos Aires' water plant at Palermo and equipping that city's Ezeiza Airport with modern biofiltration sewage treatment facilities.

MACHINE DEVELOPMENTS—The year's major machine developments include a new clarifier design; a rapid-mix, externally-heated digester; a heavy-duty hydroseparator with automatic, hydraulic lifting device; a two-stage clarifier and two-stage biological filter; a launder for feeding sedimentation units radially; and a method of controlling the pH of mud in cane juice clarifiers.

* * *

The year has seen much progress with us in quiet ways, with shipments and orders balancing on the largest scale in our history. The successful operation of several important plants in our new fields has emphasized the need of staff additions.

My own journeys included a semi-vacation trip to my "Country of Origin", the Black Hills, with my brother, who last visited there fifty years ago, and a motor trip home via Red Lake and Ontario. Others have carried the major load of travel and report from the Philippines, South America, India, South Africa and Europe a strong will to go ahead and a belief that we shall conquer the threats to world peace that now lie ahead.

To our friends and our associates everywhere, we send New Year's Greetings in a spirit of faith that, while the past year has clarified world problems, 1948 will see the most important steps toward their solution.

John V. N. Dorr

570 Lexington Ave., New York 22

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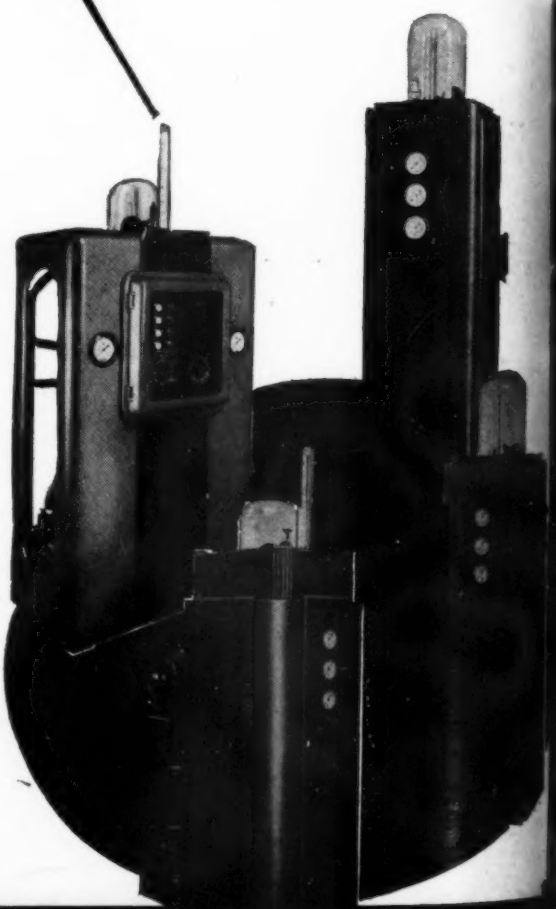
With summer over, some of the troubles that c
rination helped you solve are gone and maybe y
want to put your chlorination in "wraps" for the win
If you *do*, it's easy with a Visible Vacuum Chlorinator,
a matter of turning a couple of valves because W & T Equipment is built to "take" hard intermittent servi

But, on the other hand, if you're joining the ranks of progressive plants which are also enjoying win chlorination's many benefits, such as—elimination of plant damage due to hydrogen sulfide, prevention sludge bulking and better overall plant effectiveness—you'll find that this, too, is all in a day's w for W & T Chlorinators with year after year dependability.

In either case, your W&T Representative will be glad to tell you about the new Program Controlled Sewage Chlorinator and the many new uses of chlorination in sewage treatment made possible by new methods and new equipment.



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